PLANT PHYSIOLOGY

Published by The American Society of Plant Physiologists

EDITORIAL BOARD

MARTIN GIBBS, *Editor-in-Chief*
NOE HIGINBOTHAM, *Editor*
JOHANNES VAN OVERBEEK, *Editor*
JOSEPH E. VARNER, *Editor*
JEROME A. SCHIFF, GEORGE M. CHENIAE, *Advisory Editors*

D. J. ARMSTRONG
M. AVRON
H. BEEVERS
L. BEEVERS
N. I. BISHOP
C. C. BLACK, JR.
J. BONNER
J. S. BOYER
J. K. BRYAN
S. P. BURG
R. H. BURRIS
M. J. CHRISPEELS
J. DAINTY
D. B. DICKINSON
R. A. DILLEY
P. FILNER
L. R. FOX
P. R. GORHAM
R. H. HAGEMAN
R. H. HALL
J. B. HANSON
R. W. F. HARDY
G. H. HEICHEL
J. P. HELGESON
S. B. HENDRICKS
A. J. HIATT
T. K. HODGES
T. C. HSIAO
R. C. HUFFAKER
E. G. JAWORSKI
R. L. JONES
H. J. KENDE
J. L. KEY
P. E. KOLATTUKUDY
D. T. A. LAMPORT
G. G. LATIES
J. E. LEGGETT
R. P. LEVINE
M. LIEBERMAN
M. MAZELIS
P. W. MORGAN
J. B. MUDD
T. MURASHIGE
J. MYERS
A. OAKS
B. G. PICKARD
H. K. PRATT
W. K. PURVES
D. W. RAINS
K. RASCHKE
S. L. RAWLINS
C. W. ROSS
F. B. SALISBURY
A. SAN PIETRO
J. SCHEIBE
J. SHEN-MILLER
L. K. SHUMWAY
F. K. SKOOG
O. E. SMITH
R. M. SPANSWICK
H. A. STAFFORD
B. B. STOWE
C. A. SWANSON
B. M. SWEENEY
C. B. TANNER
R. B. TAYLORSON
I. P. TING
N. E. TOLBERT
J. G. TORREY
P. E. WAGGONER
V. WALBOT
D. A. WALKER
R. T. WEDDING
C. M. WILSON
S. F. YANG
S. ZALIK
J. A. D. ZEEVAART
I. ZELITCH
M. H. ZIMMERMANN

Volume 55, Numbers 1–6, Pages 1–1125 1975

PRINTED BY WAVERLY PRESS
BALTIMORE, MD. 21202

Copyright © 1975 by
The American Society of Plant Physiologists

Volume Contents

Number 1. January

Composition and Structure of Protein Bodies and Spherosomes Isolated from Ungerminated Seeds of *Sorghum bicolor* (Linn.) Moench. CLIFFORD A. ADAMS AND LAWRENCE NOVELLIE 1

Acid Hydrolases and Autolytic Properties of Protein Bodies and Spherosomes Isolated from Ungerminated Seeds of *Sorghum bicolor* (Linn.) Moench. CLIFFORD A. ADAMS AND LAWRENCE NOVELLIE 7

Effect of Disalicylidenepropanediamine on the Light-dependent Reduction of Carbon Dioxide and Glycerate 3-Phosphate in Intact Spinach Chloroplasts. J. MICHAEL ROBINSON, ERWIN LATZKO, AND MARTIN GIBBS 12

Ozone-induced Fatty Acid and Viability Changes in *Chlorella*. PAULA E. FREDERICK AND ROBERT L. HEATH 15

Oxygen Availability in Polyethylene Glycol Solutions and Its Implications in Plant-Water Relations. JOHN MEXAL, JAMES T. FISHER, JANET OSTERYOUNG, AND C. P. PATRICK REID 20

Isolation of Polysaccharides Sulfated during Early Embryogenesis in *Fucus*. WILLIAM E. HOGSETT AND RALPH S. QUATRANO 25

The Glycolate Pathway and Photosynthetic Competence in *Euglena*. BARRY DAVIS AND MICHAEL J. MERRETT 30

The Reaction of Coumarins with Horseradish Peroxidase. RICHARD W. MILLER, J.-CLAUDE SIROIS, AND HIROKAZU MORITA 35

Metabolism of ^{3}H-Gibberellin A_1 and ^{3}H-Gibberellin A_4 by *Phaseolus coccineus* Seedlings. DAVID R. REEVE, ALAN CROZIER, RICHARD C. DURLEY, DAVID M. REID, AND RICHARD P. PHARIS 42

The Control Properties of Phosphofructokinase in Relation to the Respiratory Climacteric in Banana Fruit. SEPPO O. SALMINEN AND ROY E. YOUNG 45

The Effect of Nucleotides and Inhibitors on Respiration in Isolated Wheat Mitochondria. M. KEITH POMEROY 51

Kinetics and Energetics of Light-driven Chloroplast Glutamine Synthesis. CARY A. MITCHELL AND C. RALPH STOCKING 59

The Structure of Plant Cell Walls. VII. Barley Aleurone Cells. MICHAEL MCNEIL, PETER ALBERSHEIM, LINCOLN TAIZ, AND RUSSELL L. JONES 64

Citrate Cleavage Enzymes from Developing Soybean Cotyledons. Incorporation of Citrate Carbon into Fatty Acids. DANIEL R. NELSON AND ROBERT W. RINNE 69

The Mechanism of Ethylene and Cyanide Action in Triggering the Rise in Respiration in Potato Tubers. THEOFANES SOLOMOS AND GEORGE G. LATIES 73

Inhibition of *in Vivo* Conversion of Methionine to Ethylene by L-Canaline and 2,4-Dinitrophenol. DENNIS P. MURR AND SHANG F. YANG 79

Plasma Membrane Adenosine Triphosphatase of Oat Roots. Activation and Inhibition by Mg^{2+} and ATP. NELSON E. BALKE AND THOMAS K. HODGES 83

The Pathway of Carbon Dioxide Fixation in Crassulacean Plants. WILLIAM COCKBURN AND ALEX MCAULAY 87

Cytokinin Effects on Growth of Quiescent Tobacco Pith Cells. GEORGE L. HAGEN AND ABRAHAM MARCUS 90

Glycosidases in Cell Wall-degrading Extracts of Ripening Tomato Fruits. STEPHEN J. WALLNER AND JOHN E. WALKER 94

Force Required to Detach Conidia of *Helminthosporium maydis*. DONALD E. AYLOR 99

Reproductive Growth and Dry Matter Production of *Glycine max* (L.) Merr. in Response to Oxygen Concentration. BRUNO QUEBEDEAUX AND RALPH W. F. HARDY 102

Influence of Temperature on the Flowering of *Lemna perpusilla* 6746 Grown under Skeleton Photoperiods. ROBERT P. DOSS 108

Influence of Timing and Number of Consecutive Inductive Photoperiodic Cycles on the Flowering of *Lemna*. ROBERT P. DOSS 110

Reversal of the Effects of a Night Interruption in *Lemna* by Inhibitors of Ribonucleic Acid Synthesis. ROBERT P. DOSS 112

Multiple Forms of Invertase in Developing Oat Internodes. RICHARD A. JONES AND PETER B. KAUFMAN 114

Characterization of Inositol-containing Phosphosphingolipids from Tobacco Leaves. Isolation and Identification of Two Novel, Major Lipids: N-Acetylglucosamidoglucuronidoinositol Phosphorylceramide and Glucosamidoglucuronidoinositol Phosphorylceramide. KARAN KAUL AND ROBERT L. LESTER 120

Studies on Phospholipid-synthesizing Enzyme Activities during the Growth of Etiolated Cucumber Cotyledons. BRUCE A. MACHER, CHRISTINE P. BROWN, T. T. MCMANUS, AND J. B. MUDD 130

Properties of Photosynthetic Mutants Isolated from *Euglena gracilis*. AMIR SHNEYOUR AND MORDHAY AVRON 137

A Method for Producing, Selecting, and Isolating Photosynthetic Mutants of *Euglena gracilis*. AMIR SHNEYOUR AND MORDHAY AVRON 142

Instructions for Contributors i

Number 2. February

Transformations of a Large Aggregate of Hydroxycinnamate Hydroxylase to Lower Molecular Weight Forms by Sulfhydryl Agents in Green Leaves of *Sorghum*. HELEN A. STAFFORD 145

Photocontrol of the Germination of *Onoclea* Spores. II. Analysis of Germination Processes by Means of Anaerobiosis. LESLIE R. TOWILL AND HIROSHI IKUMA 150

Malic Dehydrogenase from *Tamarix* Roots. Effects of Sodium Chloride *in Vivo* and *in Vitro*. ARIEH KALIR AND ALEXANDRA POLJAKOFF-MAYBER 155
The Effects of Digitonin on Photochemical Activities of Isolated Chloroplasts. SIMON P. ROBINSON AND JOSEPH T. WISKICH 163
Chloroplast and Cytoplasmic Enzymes. VI. Pea Leaf 3-Phosphoglycerate Kinases. IVAN PACOLD AND LOUISE E. ANDERSON 168
Refractive Index of Soybean Leaf Cell Walls. JOSEPH T. WOOLLEY 172
The Carotenoid Hydrocarbons of *Euglena gracilis* and Derived Mutants. J. A. GROSS, RICHARD J. STROZ, AND G. BRITTON 175
Differential Regulation of Nitrate Reductase Induction in Roots and Shoots of Cotton Plants. JOHN W. RADIN 178
Partial Reactions of Photosynthesis in Briefly Sonicated *Chlamydomonas*. I. Cell Breakage and Electron Transport Activities. VIRGINIA A. CURTIS, JERRY J. BRAND, AND ROBERT K. TOGASAKI 183
Partial Reactions of Photosynthesis in Briefly Sonicated *Chlamydomonas*. II. Photophosphorylation Activities. JERRY J. BRAND, VIRGINIA A. CURTIS, ROBERT K. TOGASAKI, AND ANTHONY SAN PIETRO 187
A Kinetic Analysis of the Effects of Gibberellic Acid, Zeatin, and Abscisic Acid on Leaf Tissue Senescence in *Rumex*. PETER J. MANOS AND JONATHAN GOLDTHWAITE 192
Inactivation of Pea Leaf Phosphofructokinase by Light and Dithiothreitol. RAJ B. KACHRU AND LOUISE E. ANDERSON 199
Maize Mitochondria. Cytochromes of Fertile and Cytoplasmic Male-sterile Lines. D. R. PRING 203
Phytochrome Characterization by Rabbit Antiserum against High Molecular Weight Phytochrome. SUSAN C. CUNDIFF AND LEE H. PRATT 207
Immunological and Physical Characterization of the Products of Phytochrome Proteolysis. SUSAN C. CUNDIFF AND LEE H. PRATT 212
Comparison of Propylene-induced Responses of Immature Fruit of Normal and *rin* Mutant Tomatoes. WILLIAM B. MCGLASSON, HERBERT C. DOSTAL, AND EDWARD C. TIGCHELAAR 218
Growth of *Chlorella* in a Nitrate-limited Chemostat. JAMES M. PICKETT 223
Localization and Properties of Ribulose Diphosphate Carboxylase from Castor Bean Endosperm. C. BARRY OSMOND, TAKASHI AKAZAWA, AND HARRY BEEVERS 226
Nucleic Acid Metabolism during Germination of Pima Cotton (*Gossypium barbadense*). WILLARD F. CLAY, FRANK R. H. KATTERMAN, AND JAMES R. HAMMETT 231
Chromatography of Cytokinins on a Neutral Polystyrene Resin. A Simple Procedure for the Separation of the *cis* and *trans* Isomers of Zeatin or Ribosylzeatin. DONALD J. ARMSTRONG AND FOLKE SKOOG 237
Biochemical Effects of Technetium-99-Pertechnetate on Microorganisms. PATRICK GEARING, CHASE VAN BAALEN, AND PATRICK L. PARKER 240
Water Uptake, Diameter Change, and Nonlinear Diffusion in Tree Stems. JEAN-YVES PARLANGE, NEIL C. TURNER, AND PAUL E. WAGGONER 247
Photocontrol of Anthocyanin Synthesis. III. The Action of Streptomycin on the Synthesis of Chlorophyll and Anthocyanin. A. L. MANCINELLI, CHIA-PING HUANG YANG, P. LINDQUIST, O. R. ANDERSON, AND I. RABINO 251
The Development of Microbodies (Glyoxysomes and Leaf Peroxisomes) in Cotyledons of Germinating Watermelon Seedlings. TAKESHI KAGAWA AND HARRY BEEVERS 258
Ethylene and the Annona Flower. AMOS BLUMENFELD 265
Glycolate Oxidase Content of Microbodies as Affected by Nitrate. NURIT ROTH-BEJERANO AND S. HERMAN LIPS 270
Diurnal Variation in Algal Acetylene Reduction (Nitrogen Fixation) *in Situ*. LARRY N. VANDERHOEF, PAUL J. LEIBSON, ROBERT J. MUSIL, CHI-YING HUANG, ROBERT E. FIEHWEG, JEFFERY W. WILLIAMS, DONALD L. WACKWITZ, AND KEVIN T. MASON 273
The Isolation and Characterization of Adenosine Monophosphate-rich Polynucleotides Synthesized by Soybean Hypocotyl Cells. Their Relation to Messenger Ribonucleic Acid. BEN D. SCHMID, NED R. SIEGEL, AND LARRY N. VANDERHOEF 277
Preparation and Properties of Chloroplasts Depleted of Chloroplast Coupling Factor 1 by Sodium Bromide Treatment. AYALA KAMIENIETZKY AND NATHAN NELSON 282
Phosphorylation of Chromatin-associated Proteins in *Lemna* and *Hordeum*. L. C. VAN LOON, A TREWAVAS, AND K. S. R. CHAPMAN 288
Regulation of the Phosphorylation of Chromatin-associated Proteins in *Lemna* and *Hordeum*. K. S. R. CHAPMAN, A. TREWAVAS, AND L. C. VAN LOON 293
Characterization of Adenosine Diphosphate Glucose Pyrophosphorylases from Developing Maize Seeds. L. CURTIS HANNAH AND OLIVER E. NELSON, JR. 297
Sulfate Transport in Cultured Tobacco Cells. IVAN K. SMITH 303
Ethylene-induced Leaf Abscission Is Promoted by Gibberellic Acid. PAGE W. MORGAN AND JAMES I. DURHAM 308
Influence of a *Ceratocystis ulmi* Toxin on Water Relations of Elm (*Ulmus americana*). NEAL K. VAN ALFEN AND NEIL C. TURNER 312
The Effects of Water Stress on the Development of the Photosynthetic Apparatus in Greening Leaves. RANDALL S. ALBERTE, EDWIN L. FISCUS, AND AUBREY W. NAYLOR 317
Abscission: The Initial Effect of Ethylene Is in the Leaf Blade. ELMO M. BEYER, JR. 322
Effects of Heat Shock on Growth and on Lipid and β-Glucan Synthetases in Leaves of *Phaseolus vulgaris* and *Vigna sinesis*. CONSTANTA MUSOLAN, LAWRENCE ORDIN, AND JUANITA I. KINDINGER 328

Phycomyces: A Change in Mechanical Properties after a Light Stimulus. JOSEPH K. E. ORTEGA, R. IGOR GAMOW, AND C. NORMAN AHLQUIST 333
High Resolution Gel Electrophoresis of Chloroplast Membrane Polypeptides. FERNANDO HENRIQUES, WILLIAM VAUGHAN, AND RODERIC B. PARK 338
Plant Desiccation and Protein Synthesis. An *in Vitro* System from Dry and Hydrated Mosses Using Endogenous and Synthetic Messenger Ribonucleic Acid. EDWARD A. GWÓŹDŹ AND J. DEREK BEWLEY 340
Studies on the Presence of Adenosine Cyclic 3′:5′-Monophosphate in Oat Coleoptiles. JAMES D. OWNBY, CLEON W. ROSS, AND JOE L. KEY 346
Some Morphogenic Differences between Monoecious and Gynoecious Cucumber Seedlings as Related to Ethylene Production. D. J. MAKUS, D. M. PHARR, AND R. L. LOWER 352
Stimulation of Phospholipid Biosynthesis during Frost Hardening of Winter Wheat. CLAUDE WILLEMOT 356
Purification and Some Properties of *Chlorella fusca* Ribulose 1,5-Diphosphate Carboxylase. J. MICHAEL LORD AND RICHARD H. BROWN 360
Cyanide-resistant Respiration of Sweet Potato Mitochondria. PHILIP F. TOMLINSON, JR. AND DONALD E. MORELAND 365
Endogenous Ethylene and Abscisic Acid Relative to Phytogerontology. B. T. SWANSON, JR., H. F. WILKINS, C. F. WEISER, AND I. KLEIN 370
Substrate Specificity of Chlorophyllase. ROGER F. MCFEETERS 377
Acid Phosphatase Development during Ripening of Avocado. JOSEPH A. SACHER 382
Loss of Phytochrome Photoreversibility *in Vitro*. I. Extraction and Partial Purification of Killer. L. RAYMOND FOX 386
Action of Nalidixic Acid on Chloroplast Replication in *Euglena gracilis*. HARVARD LYMAN, ANN S. JUPP, AND IGNACIO LARRINUA 390
The Effect of Adenosine 5′-Triphosphate on the Shibata Shift and on Associated Structural Changes in the Conformation of the Prolamellar Body in Isolated Maize Etioplasts. PETER HORTON AND RACHEL M. LEECH 393
Photosynthetic Action Spectra of Trees. I. Comparative Photosynthetic Action Spectra of One Deciduous and Four Coniferous Tree Species as Related to Photorespiration and Pigment Complements. JOHN B. CLARK AND GEOFFREY R. LISTER 401
Photosynthetic Action Spectra of Trees. II. The Relationship of Cuticle Structure to the Visible and Ultraviolet Spectral Properties of Needles from Four Coniferous Species. JOHN B. CLARK AND GEOFFREY R. LISTER 407
Zinc Nutrition and Starch Metabolism in *Phaseolus vulgaris*. L. WOON H. JYUNG, AXEL EHMANN, KEITH K. SCHLENDER, AND JAMES SCALA 414
Photoreceptor Pigment for Blue Light in *Neurospora crassa*. VICTOR MUÑOZ AND WARREN L. BUTLER 421
Spectral Characterization of the Photoreducible *b*-Type Cytochrome of *Dictyostelium discoideum*. KENNETH L. POFF AND WARREN L. BUTLER 427

Number 3. March

The Incorporation of D-Glucosamine into Glycolipids and Glycoproteins of Membrane Preparations from *Phaseolus aureus* Hypocotyls. R. MICHAEL ROBERTS AND WILLIAM E. POLLARD 431
De Novo Biosynthesis of Deoxyribonucleic Acid Polymerase during Wheat Embryo Germination. YVES Y. MORY, DAVID CHEN, AND SARA SARID 437
Rapid Effects of Indoleacetic Acid and Ethylene on the Growth of Intact Pea Roots. WILFRIED E. RAUSER AND ROGER F. HORTON 443
Revised Methods for Purification of Ribosyl-*trans*-zeatin from *Vinca rosea* L. Crown Gall Tumor Tissue. CARLOS O. MILLER 448
Effects of Ethylene, Kinetin, and Calcium on Growth and Wall Composition of Pea Epicotyls. MOHAMMAD H. MONDAL AND JAMES F. NANCE 450
Stomatal Response to Environment with *Sesamum indicum* L. ANTHONY E. HALL AND MERRILL R. KAUFMANN 455
Dichlorophenylurea-insensitive Reduction of Silicomolybdic Acid by Chloroplast Photosystem II. R. BARR, F. L. CRANE, AND R. T. GIAQUINTA 460
Metabolism of δ-Aminolevulinic Acid in Red and Blue-Green Algae. ROBERT F. TROXLER AND ANNE S. BROWN 463
Carbonic Anhydrase of Spinach. Studies on Its Location, Inhibition, and Physiological Function. BRUCE S. JACOBSON, FRANKLIN FONG, AND ROBERT L. HEATH 468
Isotope Fractionation in Photosynthetic Bacteria during Carbon Dioxide Assimilation. WILLIAM WONG, WILLIAM M. SACKETT, AND C. ROY BENEDICT 475
Oxidative Turnover of Auxins in Relation to the Onset of Ripening in Bartlett Pear. CHAIM FRENKEL 480
Protoheme Turnover and Chlorophyll Synthesis in Greening Barley Tissue. PAUL A. CASTELFRANCO AND OWEN T. G. JONES 485
Role of Membrane-bound, Fixed-charge Changes in Phytochrome-mediated Mung Bean Root Tip Adherence Phenomenon. RICHARD H. RACUSEN AND BUD ETHERTON 491
The Relationship between Satellite Deoxyribonucleic Acid, Ribosomal Ribonucleic Acid Gene Redundancy, and Genome Size in Plants. JOHN INGLE, JEREMY N. TIMMIS, AND JOHN SINCLAIR 496
L-Ornithine:2-Oxoacid Aminotransferase from Squash (*Cucurbita pepo*, L.) Cotyledons. Purification and Properties. TI-SHEN LU AND MENDEL MAZELIS 502
Mitochondrial Arginase Activity from Cotyledons of Developing and Germinating Seeds of *Vicia faba* L. CHRIS KOLLÖFFEL AND HENK D. VAN DIJKE 507

Time-dependent Behavior of a Mathematical Model for Munch Translocation. Application to Recovery from Cold Inhibition. JACK M. FERRIER AND A. LAWRENCE CHRISTY 511
Carbon Dioxide and Senescence in Cotton Plants. CHONG W. CHANG 515
Photosynthetic Activity and Membrane Polypeptide Composition of Supergranal Chloroplasts from Plant Tissue Cultures Containing a Viruslike Particle. DONNA D. SMITH AND RICHARD D. SJOLUND 520
Studies on the Mode of Action of Aminotriazole in the Induction of Chlorosis. M. VIVEKANANDAN AND A. GNANAM 526
Water Conservation in *Kalanchoe blossfeldiana* in Relation to Carbon Dioxide Dark Fixation. GEORGE G. ZABKA AND S. N. CHATURVEDI 532
Involvement of the Golgi Apparatus in the Synthesis and Secretion of Hydroxyproline-rich Cell Wall Glycoproteins. MICHAEL GARDINER AND MAARTEN J. CHRISPEELS 536
Effect of Lanthanum on Ion Absorption in Corn Roots. ROBERT L. LEONARD, GERALD NAGAHASHI, AND WILLIAM W. THOMSON 542
Hydrogen Ion Entry as a Controlling Factor in the Acid-growth Response of Green Pea Stem Sections. ROBERT E. CLELAND AND DAVID L. RAYLE 547
Identification of Plant Hormones from Cotton Ovules. WASFY W. SHINDY AND ORRIN E. SMITH 550
Enzymes of Glycerol Metabolism in the Storage Tissues of Fatty Seedlings. ANTHONY H. C. HUANG 555
Changes in Alfalfa Stem Conductance Induced by *Corynebacterium insidiosum* Toxin. NEAL K. VAN ALFEN AND NEIL C. TURNER 559
Short Interval Leaf Movements of Cotton. CHARLES S. MILLER 562
Determination of Structure and Composition of Suberin from the Roots of Carrot, Parsnip, Rutabaga, Turnip, Red Beet, and Sweet Potato by Combined Gas-Liquid Chromatography and Mass Spectrometry. P. E. KOLATTUKUDY, KAREN KRONMAN, AND A. J. POULOSE 567
Developmental Changes in Multiple Forms of Deoxyribonucleic Acid-dependent Ribonucleic Acid Polymerase in Soybean Hypocotyl. PETER J. RIZZO AND JOE H. CHERRY 574
A Device for Comparing Callus Growth Rates *in Vitro*. WILLIAM R. KRUL AND MICHAEL COMBS 578
Temperature Sensitivity of the Latent Phase in Ethylene-induced Elongation. JOHN PALMER 581
Comparative Activity of Isomers of Zeatin and Ribosyl-Zeatin on *Funaria hygrometrica*. LURETTA D. SPIESS 583
The Influence of Aging Conditions on the Short Term Growth of Green Pea Stem Segments. DAVID J. PARRISH AND PETER J. DAVIES 586

Number 4. April

Effect of Leaf Water Deficit on Stomatal and Nonstomatal Regulation of Net Carbon Dioxide Assimilation. HENRY J. MEDERSKI, LUNG H. CHEN, AND R. BRUCE CURRY 589
Effects of Irradiance and Leaf Water Deficit on Net Carbon Dioxide Assimilation and Mesophyll and Transport Resistances. HENRY J. MEDERSKI, R. BRUCE CURRY, AND LUNG H. CHEN 594
Enzyme Content of Plant Microbodies as Affected by Experimental Procedures. S. Herman Lips 598
Metabolism of Uronic Acids in Plant Tissues. Partial Purification and Properties of Uronic Acid Oxidase from Citrus Leaves. JOSEPH RIOV 602
Cell Wall and Protoplast Isoperoxidases of Corn Leaves in Relation to Cut Injury and Infection with *Helminthosporium maydis*. HELENA BIRECKA, JAMES L. CATALFAMO, AND MICHAEL O. GARRAWAY 607
Cell Wall and Protoplast Isoperoxidases in Tobacco Plants in Relation to Mechanical Injury and Infection with Tobacco Mosaic Virus. HELENA BIRECKA, JAMES L. CATALFAMO, AND PAUL URBAN 611
Metabolism of Tritiated Gibberellins in *d-5* Dwarf Maize. I. In Excised Tissues and Intact Dwarf and Normal Plant. LINDSAY J. DAVIES AND LAWRENCE RAPPAPORT 620
Iron Deficiency and the Structure and Physiology of Maize Chloroplasts. C. RALPH STOCKING 626
Degradation of Argininosuccinate Lyase by a Protease Synthesized in Soybean Cell Suspension Cultures. P. D. SHARGOOL 632
Studies of Storage Proteins of Higher Plants. I. Concanavalin A from Three Species of the Genus *Canavalia*. DONALD R. HAGUE 636
Contribution of Nonautotrophic Carbon Dioxide Fixation to Protein Synthesis in Suspension Cultures of Paul's Scarlet Rose. KNEELAND K. NESIUS AND JOHN S. FLETCHER 643
Isolation and Characterization of Stemphylin, a Chromone Glucoside from *Stemphylium botryosum*. ISAAC BARASH, ARTHUR L. KARR, JR., AND GARY A. STROBEL 646
Postillumination Burst of Carbon Dioxide in Crassulacean Acid Metabolism Plants. CLIFTON E. CREWS, H. MAX VINES, AND CLANTON C. BLACK, JR. 652
Regulation of Glucose 6-Phosphate Dehydrogenase in Blue-Green Algae. ARTHUR GROSSMAN AND ROY E. MCGOWAN 658
Ethylene-enhanced Ion and Sucrose Efflux in Morning Glory Flower Tissue. ANDREW D. HANSON AND HANS KENDE 663
Concentration Dependencies of Some Effects of Ethylene on Etiolated Pea, Peanut, Bean, and Cotton Seedlings. JOHN D. GOESCHL AND STANLEY J. KAYS 670
Presence of Two Different Membrane-bound, KCl-stimulated Adenosine Triphosphatase Activities in Maize Roots. ROGER A. LEIGH, FRANCIS A. WILLIAMSON, AND R. GARETH WYN JONES 678
Photosynthetic Unit Size during the Synchronous Life Cycle of *Scenedesmus*. JACK MYERS AND JO-RUTH GRAHAM 686

Isolation and Regeneration of Tobacco Mesophyll Cell Protoplasts under Low Osmotic Conditions. JAMES F. SHEPARD AND ROGER E. TOTTEN 689
The Lack of Effect of Cyclic Adenosine 3′:5′-Monophosphate on *Avena* Coleoptile Growth. MIRA EDGERTON, MORRIS G. CLINE, AND MARILYN M. REHM 695
Compartmentation in *Vicia faba* Leaves. I. Kinetics of ^{14}C in the Tissues following Pulse Labeling. WILLIAM H. OUTLAW, JR., AND DONALD B. FISHER 699
Compartmentation in *Vicia faba* Leaves. II. Kinetics of ^{14}C-Sucrose Redistribution among Individual Tissues following Pulse Labeling. WILLIAM H. OUTLAW, JR., DONALD B. FISHER, AND A. LAWRENCE CHRISTY 704
Photosynthetic Activities of Spinach Leaf Protoplasts. MIKIO NISHIMURA AND TAKASHI AKAZAWA 712
Light-controlled Leaf Expansion in Peas Grown under Different Light Conditions. WILLIAM M. ELLIOT 717
Regulation of Ribulose 1,5-Diphosphate Carboxylase by Substrates and Other Metabolites. Further Evidence for Several Types of Binding Sites. DOUGLAS K. CHU AND JAMES A. BASSHAM 720
The Toxins of *Helminthosporium maydis* (Race T). A Colorimetric Determination of the Toxins, Their Appearance in Culture and in Infected Plants. DALE B. KARR, ARTHUR L. KARR, JR., AND GARY A. STROBEL 727
Ozone Injury in Soybeans. Isoflavonoid Accumulation Is Related to Necrosis. NOEL T. KEEN AND O. C. TAYLOR 731
Ribonuclease in Senescing Morning Glory. Purification and Demonstration of *de Novo* Synthesis. B. BAUMGARTNER, HANS KENDE, AND P. MATILE 734
Interaction of Kinetin and Calcium in Relation to Their Effect on Stimulation of Ethylene Production. OI-LIM LAU AND SHANG F. YANG 738
The Effect of Carbohydrates and Arginine on Arginine Metabolism by Excised Bean Leaves in the Dark. CECIL R. STEWART 741
Growth and Development of Soybean (*Glycine max* [L.] Merr.) Pods. CO_2 Exchange and Enzyme Studies. BRUNO QUEBEDEAUX AND RAYMOND CHOLLET 745
Polyribosomes from Peas. V. An Attempt to Characterize the Total Free and Membrane-bound Polysomal Population. BRIAN A. LARKINS AND ERIC DAVIES 749
The Nature of Spontaneous Changes in Growth Rate in Isolated Coleoptile Segments. MICHAEL L. EVANS AND MARK R. SCHMITT 757
Further Chemical and Morphological Characterization of Chloroplast Membranes from a Chlorophyll *b*-less Mutant of *Hordeum vulgare*. FERNANDO HENRIQUES AND RODERIC B. PARK 763
Partial Restoration of the High Rate of Plastid Pigment Development and the Ultrastructure of Plastids in Detached Water-stressed Wheat Leaves. MURRAY E. DUYSEN AND THOMAS P. FREEMAN 768
A Re-evaluation of the Nitrate Reductase Content of the Maize Root. W. WALLACE 774
Water Stress and Protein Synthesis. I. Differential Inhibition of Protein Synthesis. R. S. DHINDSA AND ROBERT E. CLELAND 778
Water Stress and Protein Synthesis. II. Interaction between Water Stress, Hydrostatic Pressure, and Abscisic Acid on the Pattern of Protein Synthesis in *Avena* Coleoptiles. R. S. DHINDSA AND ROBERT E. CLELAND 782
Initial States in the Onset of Senescence in Tobacco Leaves. AVIGAD VONSHAK AND AMOS E. RICHMOND 786
Regulation of Chlorophyll Synthesis in the Green Alga *Golenkinia*. RICHARD ELLIS, TED SPOONER, AND ROBERT YAKULIS 791
Energy State and Dinitrogen Fixation in Soybean Nodules of Dark-grown Plants. TE MAY CHING, SAUNDRA HEDTKE, STERLING A. RUSSELL, AND HAROLD J. EVANS 796

Number 5. May

Photosynthesic Enhancement Studied in Intact Spinach Chloroplasts. DWIGHT G. PEAVEY AND MARTIN GIBBS 799
Photocontrol of the Germination of *Onoclea* Spores. III. Analysis of Germination Processes by Means of Cycloheximide. LESLIE R. TOWILL AND HIROSHI IKUMA 803
Purification and Partial Characterization of Barley Leucine Aminopeptidase. TUOMAS SOPANEN AND JUHANI MIKOLA 809
Cycloheximide Is Not a Specific Inhibitor of Protein Synthesis *in Vivo*. DANIEL MCMAHON 815
Phytochrome-mediated *de Novo* Synthesis of Phenylalanine Ammonia-Lyase in Cell Suspension Cultures of Parsley. ECKARD WELLMANN AND PETER SCHOPFER 822
The Metabolism of Oat Leaves during Senescence. III. The Senescence of Isolated Chloroplasts. HYUNG T. CHOE AND KENNETH V. THIMANN 828
C_4 Photosynthesis: Light-dependent CO_2 Fixation by Mesophyll Cells, Protoplasts, and Protoplasts Extracts of *Digitaria sanguinalis*. STEVEN C. HUBER AND GERALD E. EDWARDS 835
$^{14}C_2H_4$: Its Purification for Biological Studies. ELMO M. BEYER, JR. 845
Transport of Metabolites across Isolated Envelope Membranes of Spinach Chloroplasts. RAYMOND P. POINCELOT 849
Incorporation of Mevalonic Acid into Ribosylzeatin in Tobacco Callus Ribonucleic Acid Preparations. NORIMOTO MURAI, DONALD J. ARMSTRONG, AND FOLKE SKOOG 853
Differential Cold Tolerance, Starch, Sugar, Protein, and Lipid of Yellow and Purple Nutsedge Tubers. EDWARD W. STOLLER AND EVELYN J. WEBER 859
Morphological and Photosynthetic Properties of Digitonin-treated Chloroplast Membranes from the Wild-type and *ac-5* Strains of *Chlamydomonas reinhardi*. KATHERINE E. STEINBACK AND URSULA W. GOODENOUGH 864
Comparative Studies of Glyoxysomes from Various Fatty Seedlings. ANTHONY H. C. HUANG 870

Biosynthesis of Cutin. Enzymatic Conversion of ω-Hydroxy Fatty Acids to Dicarboxylic Acids by Cell-free Extracts of *Vicia faba* Epidermis. P. E. KOLATTUKUDY, RODNEY CROTEAU, AND T. J. WALTON 875
Movement of ^{14}C-labeled Sugars into Kernels of Wheat (*Triticum aestivum* L.). FAISAL A. K. SAKRI AND JACK C. SHANNON 881
Ribulose Diphosphate Carboxylase Synthesis in *Euglena*. J. MICHAEL LORD AND MICHAEL J. MERRETT 890
The Occurrence and Development of Amylase Enzymes in Incubated, De-embryonated Maize Kernels. L. D. GOLDSTEIN AND PAUL H. JENNINGS 893
Photosynthetic Reactions in the Marine Alga *Codium vermilara*. II. Structural Studies. YEHUDA BEN-SHAUL, MORDECHAY SCHÖNFELD, AND JOSEPH NEUMANN 899
Sodium-1,2-^{14}C Acetate Incorporation in Roots of Frost-hardy and Less Hardy Alfalfa Varieties under Hardening Conditions. GILLES GRENIER, HUGH J. HOPE, CLAUDE WILLEMOT, AND HENRI-PAUL THERRIEN 906
Protein Body Composition in *Cucurbita maxima* Cotyledons as Determined by Energy Dispersive X-Ray Analysis. JOHN N. A. LOTT 913
The Interaction between Osmotic- and Pressure-induced Water Flow in Plant Roots. EDWIN L. FISCUS 917
Effects of Calcium on the Photosynthesis of Intact Leaves and Isolated Chloroplasts of Sugar Beets. NORMAN TERRY AND ROBERT P. HUSTON 923
Polysome Formation in Light-sensitive Common Purslane Seeds. BONNIE J. REGER, GRANT H. EGLEY, AND CHARLES R. SWANSON 928
Concurrent Comparisons of Stomatal Behavior, Water Status, and Evaporation of Maize in Soil at High or Low Water Potential. NEIL C. TURNER 932
The Effect of Indole-3-acetic Acid and Other Growth Regulators on the Ripening of Avocado Fruits. PETER O. TINGWA AND ROY E. YOUNG 937
The Effects of pH, Ionic Strength, and Ethylene on the Extraction of Cellulase from Abscission Zones of Citrus Leaf Explants. MOSHE HUBERMAN, RAPHAEL GOREN, AND YEHUDITH BIRK 941
Intracellular Recordings from *Phycomyces*. PHILIP M. GROVES AND R. IGOR GAMOW 946
Abscisic Acid Stimulates Elongation of Excised Pea Root Tips. DOUGLAS H. GAITHER, DONALD H. LUTZ, AND LEONARD E. FORRENCE 948
Corrections 950

Number 6. June

Leaf Tissue Senescence. Constant Responsiveness to Hormones Despite a Seasonal Cycle in Senescence Rate. PETER J. MANOS AND JONATHAN GOLDTHWAITE 951
Phytochrome, Nitrate Movement, and Induction of Nitrate Reductase in Etiolated Pea Terminal Buds. RICHARD W. JONES AND ROBERT W. SHEARD 954
Acetyl Coenzyme A-Glutamate Acetyltransferase and N^2-Acetylornithine-Glutamate Acetyltransferase of *Chlorella*. CLAYTON J. MORRIS AND JOHN F. THOMPSON 960
Pea Leaf Glutamine Synthetase. Regulatory Properties. THOMAS DENNY O'NEAL AND KENNETH W. JOY 968
In Vitro Synthesis of Ureidohomoserine by an Enzyme from Jack Bean (*Canavalia ensiformis*) Leaves. THOMAS DENNY O'NEAL 975 975
Light Sensitivity of ^{22}Na, ^{86}Rb, and ^{42}K Absorption by Different Tissues of Bean Leaves. BENJAMIN JACOBY 978
Production of Isoprene by Leaf Tissue. C. ALLAN JONES AND REINHOLD A. RASMUSSEN 982
Foliar Iron Spray Potentiates Growth of Seedlings on Iron-free Media. PETER M. NEUMANN AND RIVKA PRINZ 988
Changes in Enzyme Regulation during Growth of Maize. I. Progressive Desensitization of Homoserine Dehydrogenase during Seedling Growth. BENJAMIN F. MATTHEWS, ANDREW W. GURMAN, AND JOHN K. BRYAN 991
Changes in Enzyme Regulation during Growth of Maize. II. Relationships among Multiple Molecular Forms of Homoserine Dehydrogenase. CYNTHIA A. DICAMELLI AND JOHN K. BRYAN 999
Absorption and Transfer of Fe and Mn in Germinating Sorghum. SESHADRI KANNAN AND BENEDICT JOSEPH 1006
Loss of Ribulose 1,5-Diphosphate Carboxylase and Increase in Proteolytic Activity during Senescence of Detached Primary Barley Leaves. LARRY W. PETERSON AND RAY C. HUFFAKER 1009
Effect of Gibberellic Acid on Crown Gall Tumor Induction in Aging Primary Pinto Bean Leaves. VINOD K. ANAND, CHRIS BAUER, AND GARY T. HEBERLEIN 1016
Microbody-marker Enzymes during Transition from Phototrophic to Organotrophic Growth in *Euglena*. NEVILLE COLLINS AND MICHAEL J. MERRETT 1018
The Glyceraldehyde 3-Phosphate and Glycerate 3-Phosphate Shuttle and Carbon Dioxide Assimilation in Intact Spinach Chloroplasts. ELCHANAN S. BAMBERGER, BARRY A. EHRLICH, AND MARTIN GIBBS 1023
Control of Storage Protein Metabolism in the Cotyledons of Germinating Mung Beans: Role of Endopeptidase. MAARTEN J. CHRISPEELS AND D. BOULTER 1031
Galactolipid Synthesis in *Vicia faba* Leaves. I. Galactose, Glycerol, and Fatty Acid Labeling after $^{14}CO_2$ Feeding. JOHN P. WILLIAMS, GARRY R. WATSON, MOBASHSHER-UDDIN KAHN, AND STEPHEN LEUNG 1038
Regulation of Cell Wall Synthesis in *Avena* Stem Segments by Gibberellic Acid. MICHAEL J. MONTAGUE AND HIROSHI IKUMA 1043
Carbon-13 Nuclear Magnetic Resonance Analysis of Metabolism in Soybean Labeled by $^{13}CO_2$. JACOB SCHAEFER, E. O. STEJSKAL, AND C. F. BEARD 1048
C_4 Photosynthesis in Tree Form *Euphorbia* Species from Hawaiian Rainforest Sites. ROBERT W. PEARCY AND JOHN TROUGHTON 1054

Photoaffinity-labeled Auxins. Synthesis and Biological Activity. NELSON J. LEONARD, JOHN C. GREENFIELD, RUTH SCHMITZ, AND FOLKE SKOOG 1057
Interactions of Microtubule Disorganizers, Plant Hormones, and Red Light in Wheat Coleoptile Segment Growth. VERNA R. LAWSON AND ROBERT L. WEINTRAUB 1062
Relation between Mesophyll Surface Area, Photosynthetic Race, and Illumination Level during Development for Leaves of *Plectranthus parviflorus* Henckel. PARK S. NOBEL, LAWRENCE J. ZARAGOZA, AND WILLIAM K. SMITH 1067
Stereoisomeric Characterization of Tartaric Acid Produced during L-Ascorbic Acid Metabolism in Plants. GEORGE WAGNER, JOAN C. YANG, AND FRANK A. LOEWUS 1071
Ethylene-forming Systems in Etiolated Pea Seedling and Apple Tissue. MORRIS LIEBERMAN AND ALICE T. KUNISHI 1074
The Role of Cytokinins in Chloroplast Lamellar Development. RANDALL S. ALBERTE AND AUBREY W. NAYLOR 1079
Auxin and the Response of Pea Roots to Auxin Transport Inhibitors: Morphactin. DOUGLAS H. GAITHER 1082
Carbon Dioxide Assimilation by Leaves, Isolated Chloroplasts, and Ribulose Bisphosphate Carboxylase from Spinach. ROSS MCC. LILLEY AND DAVID A. WALKER 1087
Inhibition of Prechill-induced Dark Germination in *Sorghum halepense* (L.) Pers. Seeds by Phytochrome Transformations. RAY B. TAYLORSON 1093
Perithecial Formation in *Gelasinospora reticulispora*. IV. Action Spectra for the Photoinduction. YASUNORI INOUE AND MASAKI FURUYA 1098
Nitrate Uptake and Assimilation by Wheat Seedlings during Initial Exposure to Nitrate. DOYLE A. ASHLEY, WILLIAM A. JACKSON, AND RICHARD J. VOLK 1102
Parthenocarpic Fruit Development from Grafted Ovaries of *Cucuminis sativus* L. DANIEL J. CANTLIFFE AND SHARAD C. PHATAK 1107
Plant Desiccation and Protein Synthesis. II. On the Relationship between Endogenous Adenosine Triphosphate Levels and Protein-synthesizing Capacity. J. DEREK BEWLEY AND EDWARD A. GWÓŹDŹ 1110
Solubilization of Enzymes from Glyoxysomes of Maize Scutellum. GIOVANNA P. LONGO, ERMANNO BERNASCONI, AND CLAUDIO P. LONGO 1115
Transplantation Studies with Immature Fruit of Normal, and *rin* and *nor* Mutant Tomatoes. YOSEF MIZRAHI, HERBERT C. DOSTAL, WILLIAM B. MCGLASSON, AND JOE H. CHERRY 1120
Peroxidative Activity in *Euglena gracilis*. RICHARD H. BROWN, NEVILLE COLLINS, AND MICHAEL J. MERRETT 1123
Title Page i
Volume Contents iii
Author Index xi
Subject Index xv

Author Index

A

Adams, Clifford A., 1, 7
Ahlquist, C. Norman, 333
Akazawa, Takashi, 226, 712
Albersheim, Peter, 64
Alberte, Randall S., 317, 1079
Anand, Vinod K., 1016
Anderson, Louise E., 168, 199
Anderson, O. R., 251
Armstrong, Donald J., 237, 853
Ashley, Doyle A., 1102
Avron, Mordhay, 137, 142
Aylor, Donald E., 99

B

Balke, Nelson E., 83
Bamberger, Elchanan S., 1023
Barash, Isaac, 646
Barr, R., 460
Bassham, James A., 720
Bauer, Chris, 1016
Baumgartner, B., 734
Beard, C. F., 1048
Beevers, Harry, 226, 258
Benedict, C. Roy, 475
Ben-Shaul, Yehuda, 899
Bernasconi, Ermanno, 1115
Bewley, J. Derek, 340, 1110
Beyer, Elmo M., Jr., 322, 845
Birecka, Helena, 607, 611
Birk, Yehudith, 941
Black, Clanton C., Jr., 652
Blumenfeld, Amos, 265
Boulter, D., 1031
Brand, Jerry J., 183, 187
Britton, G., 175
Brown, Anne S., 463
Brown, Christine P., 130
Brown, Richard H., 360, 1123
Bryan, John K., 991, 999
Butler, Warren L., 421, 427

C

Cantliffe, Daniel J., 1107
Castelfranco, Paul A., 485
Catalfamo, James L., 607, 611
Chang, Chong W., 515
Chapman, K. S. R., 288, 293
Chaturvedi, S. N., 532
Chen, David, 437
Chen, Lung H., 589, 594
Cherry, Joe H., 574, 1120
Ching, Te May, 796
Choe, Hyung T., 828
Chollet, Raymond, 745
Chrispeels, Maarten J., 536, 1031
Christy, A. Lawrence, 511, 704
Chu, Douglas K., 720
Clark, John B., 401, 407
Clay, Willard F., 231
Cleland, Robert E., 547, 778, 782
Cline, Morris G., 695
Cockburn, William, 87
Collins, Neville, 1018, 1123
Combs, Michael, 578
Crane, F. L., 460
Crews, Clifton E., 652
Croteau, Rodney, 875
Crozier, Alan, 42
Cundiff, Susan C., 207, 212
Curry, R. Bruce, 594
Curtis, Virginia A., 183, 187

D

Davies, Eric, 749
Daires, Lindsay J., 620
Davies, Peter J., 586
Davis, Barry, 30
Dhindsa, R. S., 778, 782
DiCamelli, Cynthia A., 999
Doss, Robert P., 108, 110, 112
Dostal, Herbert C., 218, 1120
Durham, James I., 308
Durley, Richard C., 42
Duysen, Murray E., 768

E

Edgerton, Mira, 695
Edwards, Gerald E., 835
Egley, Grant H., 928
Ehmann, Axel, 414
Ehrlich, Barry A., 1023
Elliot, William M., 717
Ellis, Richard, 791
Etherton, Bud, 491
Evans, Harold J., 796
Evans, Michael L., 757

F

Ferrier, Jack M., 511
Fiehweg, Robert E., 273
Fiscus, Edwin L., 317, 917
Fisher, Donald B., 699, 704
Fisher, James T., 20
Fletcher, John S., 643
Fong, Franklin, 468
Forrence, Leonard E., 948
Fox, L. Raymond, 386
Frederick, Paula E., 15
Freeman, Thomas P., 768
Frenkel, Chaim, 480
Furuya, Masaki, 1098

G

Gaither, Douglas H., 948, 1082
Gamow, R. Igor, 333, 946
Gardiner, Michael, 536
Garraway, Michael O., 607
Gearing, Patrick, 240
Giaquinta, R. T., 460
Gibbs, Martin, 12, 799, 1023
Gnanam, A., 526
Goeschl, John D., 670
Goldstein, L. D., 893
Goldthwaite, Jonathan, 192, 951
Goodenough, Ursula W., 864
Goren, Raphael, 941
Graham, Jo-Ruth, 686
Greenfield, John C., 1057
Grenier, Gilles, 906
Gross, J. A., 175
Grossman, Arthur, 658
Groves, Philip M., 946
Gurman, Andrew W., 991
Gwóźdź, Edward A., 340, 1110

H

Hagen, George L., 90
Hague, Donald R., 636
Hall, Anthony E., 455
Hammett, James R., 231
Hannah, L. Curtis, 297
Hanson, Andrew D., 663
Hardy, Ralph W. F., 102
Heath, Robert L., 15, 468
Heberlein, Gary T., 1016
Hedtke, Saundra, 796
Henriques, Fernando, 338, 763
Hodges, Thomas K., 83
Hogsett, William E., 25
Hope, Hugh J., 906
Horton, Peter, 393
Horton, Roger F., 443
Huang, Anthony H. C., 555, 870
Huang, Chi-Ying, 273
Huber, Steven C., 835
Huberman, Moshe, 941
Huffaker, Ray C., 1009
Huston, Robert P., 923

I

Ikuma, Hiroshi, 150, 803, 1043
Ingle, John, 496
Inoue, Yasunori, 1098

J

Jackson, William A., 1102
Jacobson, Bruce S., 468
Jacoby, Benjamin, 978
Jennings, Paul H., 893
Jones, C. Allan, 982
Jones, Owen T. G., 485
Jones, Richard A., 114
Jones, Richard W., 954
Jones, Russell L., 64
Joseph, Benedict, 1006
Joy, Kenneth W., 968
Jupp, Ann S., 390
Jyung, Woon H., 414

K

Kachru, Raj B., 199
Kagawa, Takeshi, 258
Kahn, Mobashsher-Uddin, 1038
Kalir, Arieh, 155
Kamienietzky, Ayala, 282
Kannan, Seshadri, 1006
Karr, Arthur L., Jr., 646, 727
Karr, Dale B., 727
Katterman, Frank R. H., 231
Kaufman, Peter B., 114
Kaufmann, Merrill R., 455
Kaul, Karan, 120
Kays, Stanley J., 670

Keen, Noel T., 731
Kende, Hans, 663, 734
Key, Joe L., 346
Kindinger, Jaunita I., 328
Klein, I., 370
Kolattukudy, P. E., 567, 875
Kollöffel, Chris, 507
Kronman, Karen, 567
Krul, William R., 578
Kunishi, Alice T., 1074

L

Larkins, Brian A., 749
Larrinua, Ignacio, 390
Laties, George G., 73
Latzko, Erwin, 12
Lawson, Verna R., 1062
Leech, Rachel M., 393
Leibson, Paul J., 273
Leigh, Roger A., 678
Leonard, Nelson J., 1057
Leonard, Robert L., 542
Lester, Robert L., 120
Leung, Stephen, 1038
Lieberman, Morris, 1075
Lilley, Ross McC., 1087
Lindquist, P., 251
Lips, S. Herman, 270, 598
Lister, Geoffrey R., 401, 407
Loewus, Frank A., 1071
Longo, Claudio P., 1115
Longo, Giovanna P., 1115
Lord, J. Michael, 360, 890
Lott, John N. A., 913
Lau, Oi-lim, 738
Lower, R. L., 352
Lu, Ti-Shen, 502
Lutz, Donald H., 948
Lyman, Harvard, 390

M

Macher, Bruce A., 130
Makus, D. J., 352
Mancinelli, A. L., 251
Manos, Peter J., 192, 951
Marcus, Abraham, 90
Mason, Kevin T., 273
Matile, P., 734
Matthews, Benjamin F., 991
Mazelis, Mendel, 502
McAulay, Alec, 87
McFeeters, Roger F., 377
McGlasson, William B., 218, 1120
McGowan, Roy E., 658
McMahon, Daniel, 815
McManus, T. T., 130
McNeil, Michael, 64
Mederski, Henry J., 589, 594
Merrett, Michael J., 30, 890, 1018, 1123
Mexal, John, 20
Mikola, Juhani, 809
Miller, Carlos O., 448
Miller, Charles S., 562
Miller, Richard W., 35
Mitchell, Gary A., 59
Mizrahi, Yosef, 1120
Mondal, Mohammad H., 450
Montague, Michael J., 1043
Moreland, Donald E., 365
Morgan, Page W., 308
Morita, Hirokazu, 35
Morris, Clayton J., 960
Mory, Yves Y., 437
Mudd, J. B., 130
Muñoz, Victor, 421
Murai, Norimoto, 853
Murr, Dennis P., 79
Musil, Robert J., 273
Musolan, Constanta, 328
Myers, Jack, 686

N

Nagahashi, Gerald, 542
Nance, James F., 450
Naylor, Aubrey W., 317, 1079
Nelson, Daniel R., 69
Nelson, Nathan, 382
Nelson, Olivier E., Jr., 297
Nesius, Kneeland K., 643
Neumann, Joseph, 899
Neumann, Peter M., 988
Nishimura, Mikio, 712
Nobel, Park S., 1067
Novellie, Lawrence, 1, 7

O

O'Neal, Thomas Denny, 968, 975
Ordin, Lawrence, 228
Ortega, Joseph K. E., 333
Osmond, C. Barry, 226
Osteryoung, Janet, 20
Outlaw, William H., Jr., 699, 704
Ownby, James D., 346

P

Pacold, Ivan, 168
Palmer, John, 581
Park, Roderic B., 338, 763
Parker, Patrick L., 240
Parlange, Jean-Yves, 247
Parrish, David J., 586
Pearcy, Robert W., 1054
Peavey, Dwight G., 799
Peterson, Larry W., 1009
Pharis, Richard P., 42
Pharr, D. M., 352
Phatak, Sharad C., 1107
Pickett, James M., 223
Poff, Kenneth L., 427
Poincelot, Raymond P., 849
Poljakoff-Mayber, Alexandra, 155
Pollard, William E., 431
Pomeroy, M. Keith, 51
Poulose, A. J., 567
Pratt, Lee H., 207, 212
Pring, D. R., 203
Prinz, Rivka, 988

Q

Quatrano, Ralph S., 25
Quebedeaux, Bruno, 102, 745

R

Rabino, I., 251
Racusen, Richard H., 491
Radin, John W., 178
Rappaport, Lawrence, 620
Rasmussen, Reinhold A., 982
Rauser, Wilfried E., 443
Rayle, David L., 547
Reeve, David R., 42
Reger, Bonnie J., 928
Rehm, Marilyn M., 695
Reid, C. P. Patrick, 20
Reid, David M., 42
Richmond, Amos E., 786
Rinne, Robert W., 69
Riov, Joseph, 602
Rizzo, Peter J., 574
Roberts, R. Michael, 431
Robinson, J. Michael, 12
Robinson, Simon P., 163
Ross, Cleon W., 346
Roth-Bejerano, Nurit, 270
Russell, Sterling A., 796

S

Sacher, Joseph A., 382
Sackett, William M., 475
Sakri, Faisal A. K., 881
Salminen, Seppo O., 45
San Pietro, Anthony, 187
Sarid, Sara, 437
Scala, James, 414
Schaefer, Jacob, 1048
Schlender, Keith K., 414
Schmid, Ben D., 277
Schmitt, Mark R., 757
Schmitz, Ruth, 1057
Schonfeld, Mordechay, 899
Schopfer, Peter, 822
Shannon, Jack C., 881
Shargool, P. D., 632
Sheard, Robert W., 954
Shepard, James F., 689
Shindy, Wasfy, W., 550
Shneyour, Amir, 137, 142
Siegel, Ned R., 277
Sinclair, John, 496
Sirois, J.-Claude, 35
Sjolund, Richard D., 520
Skoog, Folke, 237, 853, 1057
Smith, Donna D., 520
Smith, Ivan K., 303
Smith, Orrin E., 550
Smith, William K., 1067
Solomos, Theofanes, 73
Sopanen, Tuomas, 809
Spiess, Luretta D., 583
Spooner, Ted, 791
Stafford, Helen A., 145
Steinback, Katherine E., 864
Stejskal, E. O., 1048
Stewart, Cecil R., 741
Stocking, C. Ralph, 59, 626
Stoller, Edward W., 859
Strobel, Gary A., 646, 727
Stroz, Richard J., 175
Swanson, B. T., Jr., 370
Swanson, Charles R., 928

T

Taiz, Lincoln, 64
Taylor, O. C., 731
Taylorson, Ray B., 1093
Terry, Norman, 923
Therrien, Henri-Paul, 906
Thimann, Kenneth V., 828
Thompson, John F., 960
Thomson, William W., 542
Tigchelaar, Edward C., 218
Timmis, Jeremy N., 496
Tingwa, Peter O., 937

Togasaki, Robert K., 183, 187
Tomlinson, Philip F., Jr., 365
Totten, Roger E., 689
Towill, Leslie R., 150, 803
Trewavas, A., 288, 293
Throughton, John, 1054
Troxler, Robert F., 463
Turner, Neil C., 247, 312, 559, 932

U

Urban, Paul, 611

V

Van Alfen, Neal K., 312, 559
Van Baalen, Chase, 240
Vanderhoef, Larry N., 273, 277
van Dijke, Henk D., 507
van Loon, L. C., 288, 293
Vaughan, William, 338
Vines, H. Max, 652
Vivekanandan, M., 526
Volk, Richard J., 1102
Vonshak, Avigad, 786

W

Wackwitz, Donald L., 273
Waggoner, Paul E., 247
Wagner, George, 1071
Walker, David A., 1087
Walker, John E., 94
Wallace, W., 774
Wallner, Stephen J., 94
Walton, T. J., 875
Watson, Garry R., 1038
Weber, Evelyn J., 859
Weintraub, Robert L., 1062
Weiser, C. F., 370
Wellmann, Eckard, 822
Wilkins, H. F., 370
Willemot, Claude, 356, 906
Williams, Jeffery W., 273
Williams, John P., 1038
Williamson, Francis A., 678
Wiskich, Joseph T., 163
Wong, William, 475
Woolley, Joseph T., 172
Wyn Jones, R. Gareth, 678

Y

Yakulis, Robert, 791
Yang, Chia-Ping Huang, 251
Yang, Joan C., 1071
Yang, Shang F., 79, 738
Young, Roy E., 45, 937

Z

Zabka, George G., 532
Zaragoza, Lawrence J., 1067

Subject Index

A

Abscisic acid
  ethylene and phytogerontology, 370
  leaf senescence, 192
  pea root elongation, 948
  water stress and protein synthesis, 782
Abscission
  ethylene, 322
  GA_3 promotion of ethylene-induced, 308
Abscission zones of citrus leaf extraction of cellulase from, 941
Acetylene, diurnal variation in algal reduction, 273
N-Acetylglucosamidoglucuronidoinositol phosphorylceramide from tobacco leaves, 120
Acid hydrolases from sorghum seeds, 7
Acid phosphatase development during avocado ripening, 382
Actinomycin D reversal of night interruption in *Lemna*, 112
Adenosine diphosphate glucose pyrophosphorylases from developing corn seeds, 297
Adenosine monophosphate
  cyclic
    in oat coleoptiles, 346
    lack of effect on oat coleoptile growth, 695
  soybean polynucleotides rich in, 277
Adenosine triphosphatase
  activities in corn roots, 678
  plasma membrane of oat roots, 83
Adenosine triphosphate
  endogenous levels and protein-synthesizing capacity, 1110
  Shibata shift and prolamellar body, 393
Aging
  crown gall tumor susceptibility, 1016
  growth of pea stem, 586
Aleurone, barley, cell structure, 64
Alfalfa
  ^{14}C-lipids in frost-hardy roots, 906
  stem conductance changes induced by *Corynebacterium* toxin, 559
Alga
  ALA metabolism, 463
  diurnal variation in acetylene reduction, 273
  glucose-6-P dehydrogenase regulation, 658
  marine, photosynthesis, 899
  photosynthetic unit, 686
  regulation of chlorophyll synthesis, 791
Aminolevulinic acid metabolism in algae, 463
Aminotriazole, induction of chlorosis, 526
Amylase enzymes in de-embryonated corn kernels, 893
Anaerobiosis, fern spore germination control, 150
Annona, ethylene and flower of, 265
Anthocyanin, photocontrol of synthesis, 251
Apple, ethylene-forming systems, 1074
Arginase activity from bean cotyledons, 507
Arginine metabolism in bean leaves, 741
Argininosuccinate lyase degradation by protease, 632
Ascorbic acid, configuration of tartaric acid produced during metabolism of, 1071
Auxin
  pea root response to auxin transport inhibitors, 1082
  photoaffinity-labeled, 1057
  ripening in pear, 480
Avocado
  acid phosphatase development during ripening, 382
  IAA and ripening, 937

B

Bacteria, isotope fractionation in, 475
Banana, control proerties of phosphofructokinase, 45
Barley
  aleurone cells, 64
  leucine aminopeptidase, 809
  membranes from chlorophyll mutant, 763
  phosphorylation of chromatin proteins, 288, 293
  protoheme turnover and chlorophyll synthesis, 485
  RuDP carboxylase and proteolytic activity in senescing leaves, 1009
Bean
  arginine metabolism in leaves, 741
  broad, arginase activity of cotyledons, 507
  castor, RuDP carboxylase from endosperm, 226
  concentration effects of ethylene on seedlings, 670
  gibberellin metabolism in seedlings, 42
  heat effects on glucan synthetases, 328
  iron spray potentiating seedling growth, 988
  jack
    concanavalin A from, 636
    ureidohomoserine, synthesis, 975
    water stress and chloroplast development, 317
  location of Na, K, and Rb in leaf, 978
  mung
    endopeptidase, 1031
    fixed charges on membranes, 491
    glucosamine incorporation into membranes, 431
    interaction of Ca^{2+} and kinetin, 738
  navy, Zn nutrition and starch metabolism, 414
  pinto, Ga_3 effects on tumor susceptibility, 1016
Beet
  composition of root suberin, 567
  sugar, calcium effects on photosynthesis, 923

C

Calcium
  growth and wall composition of pea epicotyls, 450
  interaction with kinetin in stimulation of ethylene production, 738
  photosynthesis of beet leaves, 923
Callus
  growth rates, 578
  tobacco, incorporation of mevalonic acid into ribosylzeatin in RNA from, 853
L-Canaline, inhibition of conversion of methionine to ethylene, 79
Carbohydrates, arginine metabolism in bean leaves, 741
Carbon 13, nuclear magnetic resonance analysis of soybean metabolism, 1048
Carbon dioxide
  assimilation
    G3P/3-PGA shuttle, 1023
    photosynthetic, 1087
  exchange and soybean pod development, 745
  isotope fractionation in bacteria during assimilation of, 475
  light-dependent fixation, 835
  nonautotrophic fixation and protein synthesis, 643
  pathway of fixation in Crassulacean plants, 87
  postillumination burst in Crassulacean acid metabolism plants, 652
  reduction in spinach chloroplasts, 12
  sensescence in cotton, 515
  water conservation in *Kalanchoe* and dark fixation, 532
  water deficit and assimilation, 589, 594
Carbonic anhydrase of spinach, 468
Carotenoid hydrocarbons of *Euglena*, 175
Carrot, composition of root suberin, 567
Cellulase extraction from citrus leaf abscission zones, 941
Ceratocystis ulmi toxin, water relations of elm, 312
Chemostat, nitrate-limited, growth of *Chlorella* in, 223
Chlamydomonas
  digitonin-treated chloroplast membrane, 864
  electron transport and cell breakage in sonicated, 183
  photophosphorylation in sonicated, 187
Chlorella
  glutamate acetylation, 960
  growth in nitrate-limited chemostat, 223
  ozone effects, 15
  ribulose-diP carboxylase, 360
Chlorophyll
  action of streptomycin on synthesis of, 251
  membranes from a mutant, 763
  regulation of synthesis in alga, 791
Chlorophyllase, substrate specificity, 377
Chloroplasts
  beet, calcium effects on photosynthesis 923
  corn, iron deficiency, 626
  digitonin-treated membrane, 864
  Euglena, nalidixic acid and replication, 390
  jack bean, water stress and development of, 317
  lettuce, sodium bromide treatment, 282
  oat, senescence, 828

Chloroplasts—*continued*
pea
digitonin effects on photochemical activities, 163
glutamine synthesis, 59
3-phosphoglycerate kinases, 168
role of cytokinins in lamellar development, 1079
spinach
CO_2 assimilation, 1087
G3P/3-PGA shuttle and CO_2 fixation, 1023
metabolite transport across envelope membranes, 849
photosynthesis, 12
photosynthetic enhancement, 799
photosystem II, 460
separation of polypeptides, 338
supergranal, from plant cultures with viruslike particle, 520
Chlorophyll synthesis in greening barley, 485
Chlorosis, aminotriazole in induction of, 526
Chromatin, phosphorylation of proteins associated with in *Lemna* and barley, 288, 293
Citrate cleavage enzyme from developing soybean cotyledons, 69
Climacteric, banana fruit, control properties of phosphofructokinase, 45
Cold
phospholipid synthesis during hardening, 356
tolerance of nutsedge tubers, 859
Coleoptile
oat
cyclic AMP in, 346
lack of effect of cAMP on growth, 695
water stress and protein synthesis, 778, 782
spontaneous growth responses, 757
wheat, growth, 1062
Concanavalin A from three species of *Canavalia*, 636
Conidia, *Helminthosporium*, force required to detach, 99
Corn
ADPGlu pyrophosphorylases from developing seeds, 297
amylase enzymes in kernels, 893
ATPases from roots, 678
cell wall and protoplast isoperoxidases of leaves in injury and infection, 607
comparative water status, 932
cytochromes of fertile and sterile lines, 203
dwarf, metabolism of tritiated gibberellins, 620
effect of ATP on Shibata shift and prolamellar body, 393
growth-dependent enzyme desensitization, 991
iron deficiency, 626
lanthanum effect on ion absorption in roots, 542
multiple homoserine dehydrogenases, 999
nitrate reductase in root, 774
solubilization of glyoxysome enzymes, 1115
Corynebacterium, alfalfa stem conductance changes, 559
Cotton
CO_2 and senescence, 515
concentration effects of ethylene on seedlings, 670
control of nitrate reductase activity, 178
ethylene and leaf abscission, 322
GA_3 promotion of ethylene-induced leaf abscission, 308
hormones from ovules, 550
nucleic acid metabolism during germination, 231
short interval leaf movements, 562
Cotyledons
bean
arginase activity, 507
endopeptidase, 1031
cucumber, phospholipid synthesis, 130
soybean, citrate cleavage enzyme from, 69
squash
L-ornithine:2-oxoacid aminotransferase from, 502
protein body composition, 913
watermelon, microbody development, 258
Coumarins, reaction with horseradish peroxidase, 35
Crassulacean acid metabolism plants
pathway of CO_2 fixation, 87
postillumination burst of CO_2, 652
Crown gall tumor
Ga_3 on susceptibility to, 1016
ribosylzeatin from, 448
Cucumber
early morphogenesis and ethylene, 352
parthenocarpic fruit development, 1107
phospholipid synthesis in cotyledons, 130
Cutin biosynthesis, 875
Cyanide
potato respiration, 73
sweet potato mitochondrial respiration, 365
Cycloheximide
Onoclea spore germination, 803
protein synthesis, 815
Cytochromes
corn, fertile and sterile lines, 203
photoreducible *b*-type, 427
Cytokinins
chloroplast lamellar development, 1079
chromatography on neutral polystyrene resin, 237
effects on growth of quiescent tobacco pith cells, 90

D

Deoxyribonucleic acid, satellite, correlation with genome size, 496
Deoxyribonucleic acid polymerase biosynthesis during wheat embryo germination, 437
Desiccation, protein synthesis, 340, 1110
Dicarboxylic acids, enzymatic conversion of hydroxy fatty acids to, 875
Dichlorophenylurea, reduction of silicomolybdic acid by chloroplast photosystem II, 460
Dictyostelium discoideum, photoreducible *b*-type cytochrome, 427
Digitaria sanguinalis, light-dependent CO_2-fixation, 835
Digitonin
Chlamydomonas chloroplast membrane treated with, 864
chloroplast photochemical activities, 163
Dinitrogen fixation in dark-grown soybean nodules, 796
2,4-Dinitrophenol, inhibition of conversion of methionine to ethylene, 79
Disalicylidenepropanediamine, photosynthesis in plastids, 12
Dithiothreitol, inactivation of pea leaf phosphofructokinase, 199
Diurnal variations in algal acetylene reduction, 273
Dutch elm disease, 312

E

Electron transport in *Chlamydomonas*, 183
Elm, toxin and water relations, 312
Elongation, ethylene-induced, temperature sensitivity of latent phase, 581
Embryogenesis, sulfated polysaccharides from *Fucus* during, 25
Emerson enhancement effect, 799
Endopeptidase in bean cotyledons, 1031
Endosperm, castor bean, RuDP carboxylase from, 226
Energy state in dark-grown soybean nodules, 796
Enzymes
amylase, in corn kernels, 893
microbody, in *Euglena*, 1018
of plant microbodies, 598
pea chloroplast and cytoplasmic, 168
Epicotyl, pea, growth and wall composition, 450
Epidermis, *Vicia faba*, conversion of hydroxy fatty acids to dicarboxylic acids, 875
Ethylene
ABA and phytogerontology, 370
annona flower, 265
concentration effects on seedlings, 670
early cucumber morphogenesis, 352
extraction of cellulase from citrus leaf abscission zones, 941
growth and wall composition of pea epicotyls, 450
inhibition of conversion of methionine to, 79
interaction of kinetin and Ca in stimulating production of, 738
ion and sucrose efflux in morning glory flower, 663
leaf abscission, 308, 322
pea root growth, 443
potato respiration, 73
radioactive, purification for biological studies, 845
systems forming 1074
temperature sensitivity of elongation induced by, 581
Etioplast, corn, effect of ATP on prolamellar body, 393
Euglena
carotenoid hydrocarbons, 175
glycolate pathway and photosynthetic competence, 30
microbody enzymes, 1018
nalidixic acid and chloroplast replication, 390
peroxidative activity, 1123
photosynthetic mutants, 137, 142
RuDP carboxylase synthesis, 890
Euphorbia, C_4 photosynthesis, 1054

F

Fatty acids
hydroxy, enzymatic conversion to dicarboxylic acids, 875
incorporation of citrate carbon into, 69
labeling after $^{14}CO_2$ feeding, 1038
ozone-induced changes in *Chlorella*, 15

Fern, photocontrol of spore germination, 150
Flower
annona, ethylene, 265
morning glory, ion and sucrose efflux, 663
Flowering
chemical reversal of night interruption in *Lemna*, 112
photoperiodic cycles in *Lemna*, 110
temperature effect in *Lemna*, 108
Fruit
banana, phosphofructokinase control properties and climacteric, 45
tomato
glycosidases during ripening, 94
tissue transplants, 1120
Fucus, sulfated polysaccharides from, 25
Fungus
action spectra for perithecial induction, 1098
intracellular recordings, 946

G

Galactolipid synthesis in *Vicia faba* leaves, 1038
Galactose after $^{14}CO_2$ feeding, 1038
Gas-liquid chromatography, composition of of root suberin, 567
Genome size, correlation satellite DNA and rRNA, 496
Germination
arginase activity of bean cotyledons, 507
DNA polymerase biosynthesis in wheat embryo, 437
endopeptidase in bean cotyledons, 1031
Fe and Mn absorption, 1006
inhibition of in johnsongrass, 1093
nucleic acid metabolism in cotton during, 231
of *Onoclea* spores, photocontrol of, 803
photocontrol of in fern spores, 150
Gibberellins
control of cell wall synthesis, 1043
crown gall tumor susceptibility, 1016
leaf senescence, 192
metabolism in bean seedlings, 42
promotion of ethylene-induced leaf abscission, 308
tritiated, metabolism in dwarf corn, 620
Glucan synthetases, heat effects, 328
Glucosamidoglucuronidoinositol phosphorylceramide from tobacco leaves, 120
Glucosamine incorporation into membranes, 431
Glucose 6-phosphate dehydrogenase regulation in algae, 658
Glutamate acetylation in *Chlorella*, 960
Glutamine, chloroplast synthesis, 59
Glutamine synthetase, pea leaf, 968
Glyceraldehyde-3-P and glycerate-3-P shuttle, CO_2 assimilation, 1023
Glycerate 3-phosphate reduction in spinach chloroplasts, 12
Glycerol
enzymes of metabolism in seedling storage tissues, 555
labeling after $^{14}CO_2$ feeding, 1038
Glycolate oxidase, nitrate effect on microbody content, 270
Glycolate pathway in *Euglena*, 30
Glycoproteins, Golgi apparatus, 536
Glycosidases, in ripening tomatoes, 94
Glyoxysomes
from fatty seedlings, 870
in germinating watermelon, 258
of corn scutellum, solubilization of enzymes, 1115
Golgi apparatus in glycoproteins, 536
Growth
enzyme regulation during, 991, 999
of pea stem, aging, 586
oxygen concentration in soybean, 102
wheat coleoptile segment, 1062

H

Hardening, ^{14}C-lipids in frost-hardy alfalfa roots, 906
Heat, glucan synthetases, 328
Helminthosporium
cell wall and protoplast isoperoxidases of corn leaves infected with, 607
force required to detach conidia, 99
toxins, 727
Homoserine dehydrogenase
desensitization during seedling growth, 991
multiple forms of, 999
Hormones
from cotton ovules, 550
leaf senescence, 192
Horseradish peroxidase reaction with coumarins, 35
Hydrocarbons, carotenoid, of *Euglena*, 175
Hydrogen ion entry as factor in acid growth of pea stem, 547
Hydroxycinnamate hydroxylase in sorghum, 145
Hydroxyproline, Golgi apparatus in glycoproteins rich in, 536
Hypocotyl
bean, glucosamine incorporation into membranes, 431
soybean
AMP-rich polynucleotides synthesized by, 277
RNA polymerase in, 574

I

Indoleacetic acid
avocado ripening, 937
pea root growth, 443
Inhibitors, respiration in wheat mitochondria, 51
Inositol, phosphosphingolipids from tobacco leaves containing, 120
Internodes, oat, invertases, 114
Inveratse in oat internodes, 114
Ion absorption in corn roots, effect of lanthanum, 542
Ionic strength, extraction of cellulase from citrus leaf abscission zones, 941
Iron
absorption and transport in sorghum, 1006
foliar spray potentiating seedling growth, 988
Iron deficiency in corn chloroplasts, 626
Irradiance. *See also* Light
leaf water deficit and CO_2 assimilation, 594
Isoflavonoid accumulation and necrosis, 731
Isoperoxidases
cell wall and protoplast, of corn leaves in injury and infection, 607
cell wall and protoplast, of tobacco in injury and infection, 611
Isoprene production by leaf tissue, 982
Isotope fractionation in bacteria, 475

J

Johnsongrass, inhibition of germination, 1093

K

Kalanchoe, water conservation and CO_2 dark fixation, 532
Kernels
de-embryonated corn, amylase enzymes in, 893
wheat, sugar movement into, 881
Kinetin
growth and wall composition of pea epicotyls, 450
interaction with Ca in stimulation of ethylene production, 738

L

Lanthanum, ion absorption in corn roots, 542
Leaf
barley, RuDP carboxylase and proteolytic activity during senescence, 1009
bean
arginine metabolism, 741
GA_3 effects on tumor susceptibility, 1016
location of Na, Rb, and K, 978
ureidohomoserine synthesis in, 975
beet, calcium effects on photosynthesis, 923
citrus
extraction of cellulase from abscission zones, 941
uronic acid oxidase from, 602
corn, cell wall and protoplast isoperoxidases in injury and infection, 607
cotton
ethylene and abscission, 322
GA_3 promotion of ethylene-induced abscission, 308
short interval movements, 562
isoprene production, 982
jack bean, water stress and chloroplast development, 317
oat, metabolism during senescence, 828
pea
chloroplast and cytoplasmic enzymes, 168
glutamine synthetase, 968
inactivation of phosphofructokinase, 199
light controlled expansion, 717
Plectranthus, mesophyll surface area and photosynthesis, 1067
Rumex
hormones and senescence, 192
hormones, senescence, and season, 951
sesame, stomatal response to environment, 455
sorghum, hydroxycinnamate hydroxylase, 145
soybean, refractive index of cell walls, 172
spinach
CO_2 assimilation, 1087
protoplasts and photosynthesis, 712
tobacco
phosphosphingolipids from, 120
senescence, 786
Vicia faba
compartmentation, 699, 704
galactolipid synthesis, 1038
water deficit and CO_2 assimilation, 589, 594

Leaf—*continued*
watermelon, microbody development, 258
wheat, pigments and plastids in water stress, 768
Lemna
chemical reversal of night interruption, 112
effect of photoperiodic cycles on flowering, 110
phosphorylation of chromatin proteins, 288, 293
temperature effect on flowering, 108
Lettuce chloroplasts depleted of CF_1, 282
Leucine aminopeptidase, barley, 809
Light. *See also* Irradiance
blue, photoreceptor pigment for, 421
red, wheat coleoptile segment growth, 1062
Lipid, nutsedge tubers, 859

M

Magnesium, plasma membrane ATPase activity, 83
Malic dehydrogenase from *Tamarix* roots, 155
Manganese absorption and transport in sorghum, 1006
Mesophyll, surface area and photosynthesis, 1067
Mesophyll resistance, water deficit and CO_2 assimilation, 594
Metabolites, transport across spinach chloroplast envelope membranes, 849
Methionine, inhibition of conversion to ethylene, 79
Mevalonic acid incorporation into ribosyl-zeatin in tobacco callus RNA, 853
Microbodies
development in watermelon, 258
enzyme content, 598
nitrate effect on glycolate oxidase content, 270
Mitochondria
sweet potato, cyanide-resistant respiration, 365
wheat, effect of nucleotides and inhibitors on respiration, 51
Morning glory
ethylene-enhanced ion and sucrose efflux in flower, 663
ribonuclease in senescing, 734
Morphactin, pea root, 1082
Moss
activities of zeatin and ribosyl-zeatin, 583
plant desiccation and protein synthesis, 340
Munch model, time-dependent behavior, 511
Mutants, photosynthetic, from *Euglena*, 137, 142

N

Nalidixic acid, *Euglena* chloroplast replication, 390
Neurospora, photoreceptor pigment for blue light, 421
Nitrate
Chlorella growth in chemostat limited by, 223
glycolate oxidase content of microbodies, 270
movement of and nitrate reductase, 954
uptake and assimilation by wheat seedlings, 1102
Nitrate reductase
control of activity in cotton plants, 178
in corn root, 774
nitrate movement, 954
Nitrogen, diurnal variation in algal reduction, 273
Nodule, soybean, energy state, 796
Nuclear magnetic resonance analysis of soybean metabolism, 1048
Nucleic acid metabolism in germinating cotton, 231
Nucleotides, respiration in wheat mitochondria, 51
Nutsedge, cold tolerance, starch, sugar, protein, and lipid, 859

O

Oat
cyclic AMP in coleoptiles, 346
GA control of cell wall synthesis, 1043
invertases in internodes, 114
lack of effect of cAMP on coleoptile growth, 695
metabolism of senescing leaves, 828
plasma membrane ATPase from roots, 83
water stress and protein synthesis, 778, 782
Onoclea, photocontrol of spore germination, 803
L-Ornithine:2-oxoacid aminotransferase from squash cotyledons, 502
Ovule, cotton, hormones from, 550
Oxygen
availability in polyethylene glycol solutions, 20
concentration of and soybean growth, 102
Ozone
fatty acid and viability changes in *Chlorella*, 15
injury in soybeans, 731

P

Parsley, PAL synthesis, 822
Parsnip, composition of root suberin, 567
Parthenocarpic fruit development from cucumber, 1107
Pea
ABA stimulation of root elongation, 948
acid growth of stems, 547
aging and stem growth, 586
black eye, heat effects on glucan synthetases, 328
chloroplast glutamine synthesis, 59
concentration effects of ethylene on seedlings, 670
digitonin effects on chloroplasts, 163
effects of IAA and ethylene on root growth, 443
ethylene-forming systems, 1074
growth and wall composition of epicotyls, 450
inactivation of leaf phosphofructokinase, 199
leaf glutamine synthetase, 968
leaf 3-phosphoglycerate kinases, 168
light-controlled leaf expansion, 717
nitrate reductase and nitrate movement, 954
polyribosomes from, 749
root response to auxin transport inhibitors, 1082
Peanut, concentration effects of ethylene on seedlings, 670
Pear, auxin and ripening, 480
Perithecia, action spectra for photoinduction in fungus, 1098
Peroxidase, horseradish, reaction of coumarin with, 35
Peroxidative activity in *Euglena*, 1123
Peroxisomes, watermelon leaf, 258
Pertechnate, biochemical effects on microorganisms, 240
pH
extraction of cellulase from citrus leaf abscission zones, 941
Phenylalanine ammonia-lyase, phytochrome-mediated synthesis, 822
Phosphofructokinase
control properties of, and banana fruit climacteric, 45
pea leaf, inactivation, 199
3-Phosphoglycerate kinases, pea leaf, 168
Phospholipids
synthesis in cold hardening, 356
synthesis in cucumber cotyledons, 130
Phosphorylation of chromatin proteins in barley and *Lemna*, 288, 293
Phosphosphingolipids from tobacco leaves, 120
Photoperiod
inductive cycles and *Lemna* flowering, 110
skeleton, *Lemna* flowering, 108
Photophosphorylation in sonicated *Chlamydomonas*, 187
Photoreceptor pigment for blue light in *Neurospora*, 421
Photosynthesis
C_4, in Hawaiian *Euphorbia*, 1054
competence in *Euglena*, 30
enhancement in spinach chloroplasts, 799
in marine alga, 899
in sonicated *Chlamydomonas*, 183, 187
in soybean pods, 745
mesophyll surface area, 1067
spinach protoplasts, 712
trees, 401, 407
Photosynthetic unit of algal, 686
Photosystem II, chloroplast, DCMU-insensitive reduction of silicomolybdic acid by, 460
Phycomyces
intracellular recordings, 946
mechanical properties, 333
Phytochrome
comparative immunochemistry, 207
inhibition of germination of johnsongrass, 1093
loss of photoreversibility, 386
nitrate reductase and nitrate movement, 954
proteolysis, 212
synthesis of PAL, 822
Phytogerontology, ethylene and ABA, 370
Pigments in stressed wheat plastids, 768
Pith, tobacco, cytokinin effects on growth of quiescent cells, 90
Plastids in stressed wheat, 768
Plectranthus parviflorus, mesophyll surface area and photosynthesis, 1067
Maize. *See* Corn
Pod, soybean, growth and development, 745
Polyethylene glycol solutions, oxygen availability, 20
Polypeptides, chloroplast, separation of, 338
Polyribosomes from pea, 749
Polysaccharides, sulfated, from *Fucus*, 25

Polysome formation in light-sensitive common purslane seeds, 928
Polystyrene resin, neutral, chromatography of cytokinins on, 237
Potassium, location in bean leaf, 978
Potato
ethylene and cyanide action in respiration, 73
sweet
composition of root suberin, 567
cyanide-resistant respiration of mitochondria, 365
Prolamellar body, ATP, 393
Propylene, responses of tomato fruit, 218
Protease, degradation of argininosuccinate lyase, 632
Proteins
chromatin, phosphorylation in *Lemna* and barley, 288, 293
cycloheximide and synthesis, 815
desiccation and synthesis, 1110
nonautotrophic CO_2 fixation and synthesis of, 643
Nutsedge tubers, 859
plant desiccation and synthesis of, 340
storage, 636
control of metabolism in bean cotyledons, 1031
water stress and synthesis of, 778, 782
Protein bodies from sorghum seeds, 1, 7
Proteolysis, phytochrome, 212
Protoheme turnover in greening barley, 485
Protoplasts
light-dependent CO_2 fixation, 835
spinach leaf, photosynthesis, 712
tobacco mesophyll cell, 689
Pulse labeling, *Vicia* leaf compartmentation, 699, 704
Purslane, common, polysome formation in light-sensitive seeds, 928

R

Ribonuclease in senescing morning glory, 743
Ribonucleic acid
AMP-rich polynucleotides synthesized by soybean hypocotyl cells, 277
incorporation of mevalonic acid into ribosylzeatin in tobacco callus preparations of, 853
ribosomal, gene redundancy, correlation with genome size, 496
Ribonucleic acid polymerase in soybean hypocotyl, 574
Ribosylzeatin. *See also* Zeatin
activity on moss, 583
from crown gall tumor tissue, 448
incorporation of mevalonic acid into, in tobacco callus RNA, 853
Ribulose biphosphate carboxylase, CO_2 assimilation, 1087
Ribulose diphosphate carboxylase
Chlorella, 360
from castor bean endosperm, 226
loss during senescence of barley leaves, 1009
regulation, 720
synthesis in *Euglena*, 890
Ripening
avocado
acid phosphatase development, 382
IAA, 937
glycosidases in tomatoes, 94
in pear, auxin, 480
Root
alfalfa, ^{14}C-lipids in frost-hardy, 906
composition of suberin, 567
corn
ATPases from, 678
lanthanum effect on ion absorption, 542
nitrate reductase, 774
cotton, control of nitrate reductase activity, 178
mung bean, fixed charges on membranes, 491
oat, plasma membrane ATPase, 83
pea
ABA stimulation of elongation, 948
IAA and ethylene effects on growth, 443
response to auxin transport inhibitors, 1082
Tamarix, malic dehydrogenase, 155
water flow, 917
Rose, Paul's Scarlet, nonautotrophic CO_2 fixation, 643
Rubidium, location in bean leaf, 978
Rumex
hormones and leaf senescence, 192
hormones, senescence, and season, 951
Rutabaga, composition of root suberin, 567

S

Scutellum, corn, solubilization of glyoxysome enzymes, 1115
Seasonal cycle, hormones and senescence, 951
Seed
common purslane, polysome formation in, 928
corn, ADPGlu pyrophosphorylases, 297
johnsongrass, inhibition of germination, 1093
sorghum, protein bodies and spherosomes, 1, 7
Seedling
bean
gibberellin metabolism, 42
growth potentiation by foliar iron spray, 988
concentration effects of ethylene, 670
corn, enzyme desensitization during growth of, 991
cucumber, early morphogenesis and ethylene, 352
enzymes of glycerol metabolism in storage tissues, 555
fatty, glyoxysomes from, 870
pea, ethylene-forming systems, 1074
wheat, nitrate uptake and assimilation, 1102
Senescence
in cotton, CO_2, 515
in tobacco leaves, 786
leaf, hormones and season, 951
of barley leaves, RuDP carboxylase and proteolytic activity, 1009
oat leaf metabolism, 828
RNase in morning glory, 734
Sesame, stomatal response to environment, 455
Shibata shift, effect of ATP, 393
Shoot, cotton, control of nitrate reductase activity, 178
Sodium, location in bean leaf, 978
Sodium-1,2-^{14}C acetate incorporation in frost-hardy alfalfa roots, 906
Sodium bromide, chloroplasts depleted of CF_1 by, 282
Sodium chloride, malic dehydrogenase from *Tamarix* roots, 155
Sorghum
Fe and Mn absorption, 1006
hydroxycinnamate hydroxylase, 145
inhibition of germination, 1093
protein bodies and spherosomes, 1, 7
Soybean
Carbon 13 nuclear magnetic resonance analysis, 1048
citrate cleavage enzyme from cotyledons, 69
degradation of argininosuccinate lyase by a protease, 632
energy state in nodules, 796
oxygen concentration and growth, 102
ozone injury, 731
pod growth and development, 745
refractive index of leaf cell walls, 172
RNA polymerase in hypocotyl, 574
RNAs containing AMP, 277
Spectrometry, mass, composition of root suberin, 567
Spherosomes from sorghum seeds, 1, 7
Spinach
carbonic anhydrase, 468
CO_2 assimilation, 1087
G3P/3-PGA shuttle and CO_2 assimilation, 1023
leaf protoplasts and photosynthesis, 712
metabolite transport across envelope membranes, 849
photosynthesis in chloroplasts, 12
photosynthetic enhancement in chloroplast, 799
separation of chloroplast polypeptides, 338
Spore
fern, photocontrol of germination, 150
Onocela, photocontrol of germination, 803
Squash
L-ornithine:2-oxoacid aminotransferase from cotyledons, 502
protein body composition in cotyledons, 913
Starch
metabolism in bean, 414
nutsedge tubers, 859
Stem
alfalfa, conductance changes induced by *Corynebacterium* toxin, 559
oat, control of cell wall synthesis by GA, 1043
pea
acid growth, 547
aging and growth, 586
tree, nonlinear diffusion, 247
Stemphylin, characterization of, 646
Stomata
regulation of CO_2 assimilation, 589
response to environment in sesame, 455
Streptomycin, anthocyanin synthesis, 251
Suberin, root, composition, 567
Sucrose
efflux in morning glory, 663
redistribution after pulse labeling, 704
Sugar
movement into wheat kernels, 881
nutsedge tubers, 859
Sulfate transport in tobacco cells, 303
Sweet potato. *See* Potato, sweet

T

Tamarix, malic dehydrogenase from roots, 155
Tartaric acid, stereoisomeric characterization, 1071
Technetium-99-pertechnate, biochemical effects on microorganisms, 240
Temperature
  Lemna flowering, 108
  sensitivity of ethylene-induced elongation to, 581
2-Thiouracil, reversal of night interruption in *Lemna*, 112
Tobacco
  cell wall and protoplast isoperoxidases in injury and infection, 611
  cytokinin effect on growth of quiescent pith cells, 90
  incorporation of mevalonic acid into ribosylzeatin in callus RNA, 853
  mesophyli cell protoplasts, 689
  phosphosphingolipids from leaves, 120
  senescence in leaves, 786
  sulfate transport, 303
Tobacco mosaic virus, isoperoxidases in plants infected with, 611
Tomato
  glycosidases during ripening, 94
  responses to propylene, 218
  tissue transplants in fruits, 1120
Toxins, *Helminthosporium*, 727
Translocation, Munch, time-dependent behavior of model for, 511
Transplants, tomato fruit, 1120
Tree
  nonlinear diffusion in stems, 247
  photosynthetic action spectra, 401, 407
Tuber, nutsedge, cold tolerance, starch, sugar, protein, and lipid, 859
Turnip, composition of root suberin, 567

U

Ureidohomoserine synthesis in jack bean, 975
Uronic acid oxidase from citrus leaves, 602

V

Vicia faba
  compartmentation in leaves, 699, 704
  conversion of hydroxy fatty acids to dicarboxylic acids, 875
  galactolipid synthesis in leaves, 1038
Vinca rosea, ribosylzeatin from crown gall tumor tissue, 448

W

Water conservation in *Kalanchoe*, and CO_2 dark fixation, 532
Water deficit, CO_2 assimilation, 589, 594
Water flow in plant roots, 917
Watermelon, microbody development, 258
Water relations of elm, *Ceratocystis ulmi* toxin, 312
Water status, corn, 932
Water stress
  chloroplast development, 317
  pigments and plastids in wheat, 768
  protein synthesis, 778, 782
Wheat
  coleoptile segment growth, 1062
  DNA polymerase biosynthesis during embryo germination, 437
  effect of nucleotides and inhibitors on respiration in mitochondria, 51
  nitrate uptake and assimilation, 1102
  stressed, pigments and plastids, 768
  sugar movement into kernels, 881
  winter, phospholipid synthesis in cold hardening, 356

X

X-ray analysis, energy-dispersive, protein body composition of cotyledons, 913

Z

Zeatin. *See also* Ribosylzeatin
  activity on moss, 583
  leaf senescence, 192
  separation of isomers, 237
Zinc, nutrition in bean, 414

PLANT PHYSIOLOGY

Published by The American Society of Plant Physiologists

EDITORIAL BOARD

MARTIN GIBBS, *Editor-in-Chief*
NOE HIGINBOTHAM, *Editor*
JOHANNES VAN OVERBEEK, *Editor*
JOSEPH E. VARNER, *Editor*
JEROME A. SCHIFF, GEORGE M. CHENIAE, *Advisory Editors*

D. J. ARMSTRONG
M. AVRON
H. BEEVERS
L. BEEVERS
N. I. BISHOP
C. C. BLACK, JR.
J. BONNER
J. S. BOYER
J. K. BRYAN
S. P. BURG
R. H. BURRIS
M. J. CHRISPEELS
J. DAINTY
D. B. DICKINSON
R. A. DILLEY
P. FILNER
L. R. FOX
P. R. GORHAM
R. H. HAGEMAN
R. H. HALL
J. B. HANSON
R. W. F. HARDY
G. H. HEICHEL
J. P. HELGESON
S. B. HENDRICKS
A. J. HIATT
T. K. HODGES
T. C. HSIAO
R. C. HUFFAKER
E. G. JAWORSKI
R. L. JONES
H. J. KENDE
J. L. KEY
P. E. KOLATTUKUDY
D. T. A. LAMPORT
G. G. LATIES
J. E. LEGGETT
R. P. LEVINE
M. LIEBERMAN
M. MAZELIS
P. W. MORGAN
J. B. MUDD
T. MURASHIGE
J. MYERS
A. OAKS
B. G. PICKARD
H. K. PRATT
W. K. PURVES
D. W. RAINS
K. RASCHKE
S. L. RAWLINS
C. W. ROSS
F. B. SALISBURY
A. SAN PIETRO
J. SCHEIBE
J. SHEN-MILLER
L. K. SHUMWAY
F. K. SKOOG
O. E. SMITH
R. M. SPANSWICK
H. A. STAFFORD
B. B. STOWE
C. A. SWANSON
B. M. SWEENEY
C. B. TANNER
R. B. TAYLORSON
I. P. TING
N. E. TOLBERT
J. G. TORREY
P. E. WAGGONER
V. WALBOT
D. A. WALKER
R. T. WEDDING
C. M. WILSON
S. F. YANG
S. ZALIK
J. A. D. ZEEVAART
I. ZELITCH
M. H. ZIMMERMANN

Volume 56, Numbers 1–6, Pages 1–858 1975

PRINTED BY WAVERLY PRESS
BALTIMORE, MD. 21202

Copyright © 1975 by
The American Society of Plant Physiologists

Plant Physiol. (1975) *56*, iii–viii

Volume Contents

Number 1. July

Inhibition of Dark CO_2 Fixation and Photosynthesis in Leaf Discs of Corn Susceptible to the Host-specific Toxin Produced by *Helminthosporium maydis*, Race T. BALWANT S. BHULLAR, J. M. DALY, AND DWAYNE W. REHFELD 1
Effect of Growth in Highly Salinized Media on the Enzymes of the Photosynthetic Apparatus in Pea Seedlings. RALPH WEIMBERG 8
The Action of Valinomycin in Uncoupling Corn Mitochondria. JERRY R. HENSLEY AND JOHN B. HANSON 13
Isolation and Characterization of the Multiple 7S Globulins of Soybean Proteins. VU HUU THANH, KAZUYOSHI OKUBO, AND KAZUO SHIBASAKI 19
Incorporation of ^{14}C-Photosynthate into Protein during Leaf Development in Young *Populus* Plants. DONALD I. DICKMANN AND JOHN C. GORDON 23
Distribution Pattern of Cell Division Centers on the Epidermis of Stem Segments of *Torenia fournieri* during *de Novo* Bud Formation. HASSANE CHLYAH, MARIE TRAN THANH VAN, AND YVES DEMARLY 28
The Site of Cellulose Synthesis. Cell Surface and Intracellular β-1,4-Glucan (Cellulose) Synthetase Activities in Relation to the Stage and Direction of Cell Growth. GORDON SHORE, YVES RAYMOND, AND GORDON A. MACLACHLAN 34
Studies on Pea Ribosomal Proteins. Conformational and Biological Activity Changes of Ribosomal Subunits Derived by NH_4Cl Dissociation. CHU-YUNG LIN, SUBRINA LI-LI CHIA, ROBERT L. TRAVIS, AND JOE L KEY 39
Effects of Red Light on the Growth of Intact Wheat and Barley Coleoptiles. VERNA R. LAWSON AND ROBERT L. WEINTRAUB 44
Dark CO_2 Fixation in Gladiolus Cormels and Its Regulation during the Break of Dormancy. CHEN GINZBURG 51
Regulation of Alcohol Dehydrogenases in Maize Scutellum during Germination. DAVID TUANHUA HO AND JOHN G. SCANDALIOS 56
Metabolism of Tritiated Gibberellins in *d-5* Dward Maize. II. [^{3}H]Gibberellin A_1, [^{3}H]Gibberellin A_3, and Related Compounds. LINDSAY J. DAVIES AND LAWRENCE RAPPAPORT 60
Phosphoenolpyruvate Carboxykinase Activity in Grape Berries. H. P. RUFFNER AND W. MARK KLIEWER 67
H_2 Metabolism in Photosynthetic Organisms. I. Dark H_2 Evolution and Uptake by Algae and Mosses. AMI BEN-AMOTZ, DAVID L. ERBES, MARY ANN RIEDERER-HENDERSON, DWIGHT G. PEAVEY, AND MARTIN GIBBS 72
Isolation and Properties of Nuclei from Control and Auxin-treated Soybean Hypocotyl. YIH-MING CHEN, CHU-YUNG LIN, H. CHANG, THOMAS J. GUILFOYLE, AND JOE L. KEY 78
β-1,3-Glucan Synthase from *Lilium longiflorum* Pollen. DARLENE SOUTHWORTH AND DAVID B. DICKINSON 83
Isolation and Translation of Plant Messenger RNA. ELAINE M. TOBIN AND ATTILA O. KLEIN 88
Changes in Catechol Oxidase and Permeability to Water in Seed Coats of *Pisum elatius* during Seed Development and Maturation. IRITH MARBACH AND ALFRED M. MAYER 93
Ventilation Required to Entrain Small Particles from Leaves. DONALD E. AYLOR AND JEAN-YVES PARLANGE 97
Studies on the Development and Localization of Catalase and H_2O_2-generating Oxidases in the Endosperm of Germinating Castor Beans. ROLAND R. THEIMER AND EVA THEIMER 100
Light-enhanced Chloride Uptake by Wheat Laminae. A Comparison of Chopped and Vacuum-infiltrated Tissue. IAN R. MACDONALD AND ALAN E. S. MACKLON 105
Effect of Vacuum Infiltration on Photosynthetic Gas Exchange in Leaf Tissue. IAN R. MACDONALD 109
The Effect on the Photoconversion of Protochlorophyllide in Isolated Etioplasts of *Zea mays*. PETER HORTON AND RACHEL M. LEECH 113
Phosphate-dependent Substrate Transport into Mitochondria. Oxidative Studies. JOSEPH T. WISKICH 121
Oxygen Isotope Fractionation during Photosynthesis in a Blue-Green and a Green Alga. CATHERINE L. R. STEVENS, DAVID SCHULTZ, CHASE VAN BAALEN, AND PATRICH L. PARKER 126
The Effects of Light Intensity and Spectral Quality on Growth and Shoot Initiation in Tobacco Callus. MICHAEL SEIBERT, PHYLLIS J. WETHERBEE, AND DONALD D. JOB 130
The Metabolism of Oat Leaves during Senescence. IV. The Effects of $\alpha\alpha'$-Dipyridyl and Other Metal Chelators on Senescence. RICHARD M. TETLEY AND KENNETH V. THIMANN 140
Correlative Studies of Cell Wall Enzymes and Growth. ALLEN K. MURRAY AND ROBERT S. BANDURSKI 143
Nitrate Translocation by Detopped Corn Seedlings. FERNANDO N. EZETA AND WILLIAM A. JACKSON 148
Acceleration of Dark Reversion of Phytochrome *in Vitro* by Calcium and Magnesium. MOSHÉ NEGBI, DAVID W. HOPKINS, AND WINSLOW R. BRIGGS 157
Ultrastructural Effects of Water Stress on Chloroplast Development in Jack Bean (*Canavalia ensiformis* [L.] DC). DON P. BOURQUE, PAUL N. MCMILLIAN, WINFRED J. CLINGENPEEL, AND AUBREY W. NAYLOR 160
Carbon Dioxide Fixation in Isolated *Kalanchoe* Chloroplasts. CAROLYN LEVI AND MARTIN GIBBS 164
Instructions for Contributors i

Number 2. August

Inhibition of Gibberellic Acid-induced Elongation in *Avena* Stem Segments by a Substituted Pyrimidine. MICHAEL J. MONTAGUE 167

Rapid Initiation of Thymidine Incorporation into Deoxyribonucelic Acid in Vegetative Tobacco Stem Segments Treated with Indole-3-acetic Acid. WILLIAM L. WARDELL 171
Phosphatidylserine Synthesis in Castor Bean Endosperm. THOMAS S. MOORE, JR. 177
Conversion of Signals from Ion-specific Electrodes to Linear Concentrations. ROBERT L. HEATH 181
Incorporation of ^{14}C-Photosynthate into Major Chemical Fractions of Source and Sink Leaves of Cottonwood. RICHARD E. DICKSON AND PHILIP R. LARSON 185
Carbon Dioxide Compensation Points of Flowering Plants. EUGENE G. KRENZER, JR., DALE N. MOSS, AND R. KENT CROOKSTON 194
Relationships between Leaf Water Status, Abscisic Acid Levels, and Stomatal Resistance in Maize and Sorghum. MICHAEL F. BEARDSELL AND DANIEL COHEN 207
Induction of Responsiveness to Octopine and Lysopine in Crown-Gall Tumors. BARBARA B. LIPPINCOTT AND JAMES A. LIPPINCOTT 213
Induction of a Sensitive Response to *Helminthosporium maydis* Race T Toxin in Resistant Mitochondria of Corn (*Zea mays* L.) by Removal of the Outer Mitochondrial Membrane. LIDIA S. WATRUD, JOAN K. BALDWIN, RAYMOND J. MILLER, AND DAVID E. KOEPPE 216
Acetylene Reduction (Nitrogen Fixation) and Metabolic Activities of Soybean Having Various Leaf and Nodule Water Potentials. CHI-YING HUANG, JOHN S. BOYER, AND LARRY N. VANDERHOEF 222
Limitation of Acetylene Reduction (Nitrogen Fixation) by Photoysnthesis in Soybean Having Low Water Potentials. CHI-YING HUANG, JOHN S. BOYER, AND LARRY N. VANDERHOEF 228
Characterization of Carrot and Tobacco Cell Cultures Resistant to *p*-Fluorophenylalanine. J. ELIZABETH PALMER AND JACK WIDHOLM 233
Ripening and *in Vitro* Retention of Respiratory Control by Avocado and Pear Mitochondria. SÖZER I. ÖZELKÖK AND ROGER J. ROMANI 239
Water Use Efficiency of Field-grown Maize during Moisture Stress. THOMAS R. SINCLAIR, GAIL E. BINGHAM, EDGAR R. LEMON, AND L. HARTWELL ALLEN, JR. 245
Abscisic Acid Metabolism in Water-stressed Bean Leaves. MICHAEL A. HARRISON AND DANIEL C. WALTON 250
Quantitative Regulation of Gene Activity in Plants. JEREMY TIMMIS AND JOHN INGLE 255
Δ^1-Pyrroline-5-carboxylic Acid Dehydrogenase in Barley, a Proline-accumulating Species. SAMUEL F. BOGGESS, LESLIE G. PALEG, AND DONALD ASPINALL 259
Additive and Synergistic Effects of Kinetin and Ethrel on Germination, Thermodormany, and Polyribosome Formation in Lettuce Seeds. V. SIVAJI RAO, NARENDRA SANKHLA, AND ANWAR A. KAHN 263
Gibberellin Response in Lettuce Hypocotyl Sections. WENDY KUHN SILK AND RUSSELL L. JONES 267
$^{14}C_2H_4$: Its Incorporation and Metabolism by Pea Seedlings under Aseptic Conditions. ELMO M. BEYER, JR. 273
Partial Purification of a Growth Factor from Orange Juice Which Affects Citrus Tissue Culture and Its Replacement by Citric Acid. YAIR ERNER, ODED REUVENI, AND ELIEZER E. GOLDSCHMIDT 279
Metabolic Conversion of L-Ascorbic Acid to Oxalic Acid in Oxalate-accumulating Plants. JOAN C. YANG AND FRANK A. LOEWUS 283
Host-Pathogen Interactions. VIII. Isolation of a Pathogen-synthesized Fraction Rich in Glucan That Elicits a Defense Response in the Pathogen's Host. ANNE J. ANDERSON-PROUTY AND PETER ALBERSHEIM 286
Histochemical and Biochemical Observations on Storage Protein Metabolism and Protein Body Autolysis in Cotyledons of Germinating Mung Beans. N. HARRIS AND MAARTEN J. CHRISPEELS 292
Studies on the Secretion of Maize Root Cap Slime. I. Some Properties of the Secreted Polymer. ROBERT E. PAULL, CLARENCE M. JOHNSON, AND RUSSELL L. JONES 300
Studies on the Secretion of Maize Root Cap Slime. II. Localization of Slime Production. ROBERT E. PAULL AND RUSSELL L. JONES 307
Events Surrounding the Early Development of *Euglena* Chloroplasts. V. Control of Paramylum Degradation. STEVEN D. SCHWARTZBACH, JEROME A. SCHIFF, AND NEIL H. GOLDSTEIN 313
Events Surrounding the Early Development of *Euglena* Chloroplasts. VI. Action Spectra for the Formation of Chlorophyll, Lag Elimination in Chlorophyll Synthesis, and Appearance of TPN-dependent Triose Phosphate Dehydrogenase and Alkaline DNase Activities. JAMES M. EGAN, JR., DAVID DORSKY, AND JEROME A. SCHIFF 318
Regulation of Oxaloacetate, Aspartate, and Malate Formation in Mesophyll Protoplast Extracts of Three Types of C_4 Plants. STEVEN C. HUBER AND GERALD E. EDWARDS 324
Photomanipulation of Phytochrome in Lettuce Seeds. RICHARD E. KENDRICK AND JANE H. RUSSELL 332
Carbon Dioxide Requirements for Phytochrome Action in Photoperiodism and Seed Germination. PAWAN K. BASSI, E. BRUCE TREGUNNA, AND ADITYA N. PUROHIT 335
The Role of Abscisic Acid in Cross-Adaptation of Tobacco Plants. SAMY BOUSSIBA, ARNON RIKIN, AND AMOS E. RICHMOND 337
Phytochrome: A Re-examination of the Quaternary Structure. WILLIAM O. SMITH, JR., AND DAVID L. CORRELL 340

Number 3. September

Ribulose Diphosphate Carboxylase from Autotrophic *Euglena gracilis*. HANNAH RABINOWITZ, AVI REISFELD, DAPHNA SAGHER, AND MARVIN EDELMAN 345
Photocontrol of Anthocyanin Synthesis. IV. Dose Dependence and Reciprocity Relationships in Anthocyanin Synthesis. ALBERTO L. MANCINELLI AND ISAAC RABINO 351
Quantitative Effects of 2,4-Dichlorophenoxyacetic Acid on Growth of Suspension-cultured *Acer pseudoplatanus* Cells. JEAN-JACQUES LEGUAY AND JEAN GUERN 356

Influence of Short Term Inhibitor Treatment on the Flowering of *Lemna perpusilla* 6746. ROBERT P. DOSS 360
The Occurrence and Distribution of Poly(A) Ribonucleic Acid in Soybean. JOE L. KEY AND CAROLYN SILFLOW 364
The Influence of Temperature on Malic Acid Metabolism in Grape Berries. I. Enzyme Responses. ALAN N. LAKSO AND W. MARK KLIEWER 370
Promotion of Xyloglucan Metabolism by Acid pH. MARK JACOBS AND PETER M. RAY 373
The Regulation of Potassium Absorption in Barley Roots. ANTHONY GLASS 377
Synthesis of Endosperm Proteins in Wheat Seed during Maturation. DENNIS FLINT, GEORGE S. AYERS, AND AND STANLEY K. RIES 381
Chemical Basis for Greenbug Resistance in Small Grains. II. Identification of the Major Neutral Metabolite of Benzyl Alcohol in Barley. PREM S. JUNEJA, SUSAN C. PEARCY, ROBERT K. GHOLSON, ROBERT L. BURTON, AND KENNETH J. STARKS 385
The Effect of Sucrose on the Differentiation of Excised Fern Leaf Tissue into Either Gametophytes of Sporophytes. ANN M. HIRSCH 390
Osmoregulation in Cotton Fiber. Accumulation of Potassium and Malate during Growth. RAJINDER S. DHINDSA, CHARLES A. BEASLEY, AND IRWIN P. TING 394
Isolation of Intact Chloroplasts of *Euglena gracilis* by Isopycnic Sedimentation in Gradients of Silica. JEFFREY L. SALISBURY, AUREA C. VASCONCELOS, AND GARY L. FLOYD 399
Sites of Auxin Action. Regulation of Geotropism, Growth, and Ethylene Production by Inhibitors of Auxin Transport. DOUGLAS H. GAITHER AND FREDERICK B. ABELES 404
A Simple, Inexpensive, High Pressure Liquid Chromatographic Method for Separating Cytokinins in Plant Extracts. TUDOR H. THOMAS, JAMES E. CARROLL, FRANCIS M. R. ISENBERG, ANN PENDERGRASS, AND LYDIA HOWELL 410
Heat-induced Resistance of Sugarcane to *Helminthosporium sacchari* and Helminthosporoside. RALPH S. BYTHER AND GARY W. STEINER 415
Studies on the Growth Effects of the Canaline-Urea Cycle Amino Acids with *Lemna minor* L. GERALD A. ROSENTHAL, DUSHYANT K. GULATI, AND P. S. SABHARWAL 420
Evidence for Cytokinin in Bacterial Leaf Nodules of *Psychotria punctata* (Rubiaceae). WAYNE J. EDWARDS AND CLIFFORD E. LAMOTTE 425
Promotion of Radish Cotyledon Enlargement and Reducing Sugar Content by Zeatin and Red Light. ALBERT K. HUFF AND CLEON W. ROSS 429
Sulfur Dioxide Inhibition of Photosynthesis in Isolated Spinach Chloroplasts. JOHN E. SILVIUS, MORRIS INGLE, AND CHARLES H. BAER 434
Separation of Chlorophyll Degradation from Other Senescence Processes in Leaves of a Mutant Genotype of Meadow Fescue (*Festuca pratensis* L.). HOWARD THOMAS AND JOHN L. STODDART 438
Paradoxical Effect of Actinomycin D. Regulation of Synthesis of Wound RNase at Translation in Turnip Tissue. JOSEPH A. SACHER, ELLA J. MORGAN, AND DANIEL DE LAROSA 442
Control of Amino Acid Synthesis in Tissue Culture Cells. JOHN S. FLETCHER 450
Phytochrome-mediated Carotenoids Biosynthesis in Ripening Tomatoes. RONNIE L. THOMAS AND JOSEPH J. JEN 452
Corrections 454

Number 4. October

Dynamics of Photoassimilated Carbon in Douglas Fir Seedlings. WARREN L. WEBB 455
Alkylguanidines as Inhibitors of K^+ Transport in Isolated Barley Roots. BEATRIZ GÓMEZ LEPE AND EPIFANIO JIMÉNEZ AVILA 460
Contractile Characteristics of *Mimosa pudica* L. ROBERT T. BALMER AND JEFFERY G. FRANKS 464
Photocontrol of the Germination of *Onoclea* Spores. IV. Metabolic Changes during Germination. LESLIE R. TOWILL AND HIROSHI IKUMA 468
DPX 1840-induced Organogenesis in Xanthi-nc Tobacco Plants. WERNER J. MEUDT AND HOWARD W. BENNETT 474
Mechanism of Sulfate Transport Inhibition by Cycloheximide in Plant Tissues. FRANCO RENOSTO AND GIOVANNI FERRARI 478
Site of Action of Inhibitors of Carbon Dioxide Assimilation by Whole Lettuce Chloroplasts. ELCHANAN S. BAMBERGER AND MORDHAY AVRON 481
Accumulation of α-Aminolevulinic Acid and Its Relation to Chlorophyll Synthesis and Development of Plastid Structure in Greening Leaves. SHIMON KLEIN, EITAN HAREL, EMMA NE'EMAN, ESTHER KATZ, AND ERNA MELLER 486
Control δ-Aminolevulinic Acid and Chlorophyll Accumulation in Greening Maize Leaves upon Light-Dark Transitions. ROBERT FLUHR, EITAN HAREL, SHIMON KLEIN, AND ERNA MELLER 497
Transcription of Ribosomal and Messenger RNAs in Early Wheat Embryo Germination. SARA SPIEGEL, RALPH L. OBENDORF, AND ABRAHAM MARCUS 502
Relationships between the Transition of the Physical Phase of Membrane Lipids and Photosynthetic Parameters in *Anacystis nidulans* and Lettuce and Spinach Chloroplasts. NORIO MURATA, JOHN H. TROUGHTON, AND DAVID C. FORK 508
In Vitro Simulation of Cytoplasmic Membrane Senescence in Cotyledons. BRYAN D. MCKERSIE AND JOHN E. THOMPSON 518
Size and Specific Radioactivity of the [^{3}H]Thymidine Triphosphate Pool and DNA Synthesis in the Radicles of Germinating Cotton. FRANK R. H. KATTERMAN AND WILLARD F. CLAY 523

Comparison of DNA Polymerase of *Rhizobium meliloti* and Alfalfa Bacteroids. ALAN PAUU AND JOE R. COWLES 526
Abscission of *Phaseolus* and *Impatiens* Explants. Effects of Ionizing Radiation upon Endogenous Growth Regulators and *de Novo* Enzyme Synthesis. ROBERT B. DWELLE 529
Effect of Digitonin Concentration on Electron Transport, Phosphorylation, and Proton Uptake by Subchloroplast Particles. SIMON P. ROBINSON AND JOSEPH T. WISKICH 535
Cold Hardening in Citrus Stems. GEORGE YELENOSKY 540
Effects of Abscisic Acid and Benzyladenine on Fruits of Normal and *rin* Mutant Tomatoes. YOSEF MIZRAHI, HERBERT C. DOSTAL, WILLIAM B. MCGLASSON, AND JOE H. CHERRY 544
Ethylene Production and Respiration in Aging Leaf Segments and in Disks of Fruit Tissue of Normal and Mutant Tomatoes. WILLIAM B. MCGLASSON, B. W. POOVAIAH, AND HERBERT C. DOSTAL 547
Possible Involvement of α-Farnesene in the Development of Chilling Injury in Bananas. RON B. H. WILLS, WILF MC. BAILEY, AND KEVIN J. SCOTT 550
Propylene—A Competitor of Ethylene Action. HELMAR H. A. DOLLWET AND ROBERT E. SEEMAN 552

Number 5. November

Structure of Functional Soybean Sieve Elements. DONALD B. FISHER 555
Effects of Abscisic Acid on Growth, RNA Metabolism, and Respiration in Germinating Bean Axes. VIRGINIA WALBOT, MARY CLUTTER, AND IAN SUSSEX 570
Benzyladenine Reversal of Abscisic Acid Inhibition of Growth and RNA Synthesis in Germinating Bean Axes. IAN SUSSEX, MARY CLUTTER, AND VIRGINIA WALBOT 575
Enzymes of Carbohydrate Metabolism in the Developing Rice Grain. CONSUELO M. PEREZ, ALICIA PERDON, ADORACION P. RESURRECCION, RUTH M. VILLAREAL, AND BIENVENIDO O. JULIANO 579
Nitrogen Metabolism in Plant Cell Suspension Cultures. I. Effect of Amino Acids on Growth. JOSEF BEHREND AND RICHARD I. MATELES 584
Preadaptation of Protein Synthesis in Wheat Seedlings to High Temperature. MANFRED WEIDNER AND CORINNA ZIEMENS 590
Leaf Age as a Determinant in Stomatal Control of Water Loss from Cotton during Water Stress. WAYNE R. JORDAN, KIRK W. BROWN, AND JAMES C. THOMAS 595
Ribulose 1,5-Diphosphate Carboxylase Synthesis in *Euglena*. II. Effect of Inhibitors on Enzyme Synthesis during Regreening and Subsequent Transfer to Darkness. J. MICHAEL LORD, TERENCE L. ARMITAGE, AND MICHAEL J. MERRETT 600
Occurrence of Pyruvate Orthophosphate Dikinase in the Succulent Plant. *Kalanchoë daigremontiana* Hamet. et. Perr. TATSUO SUGIYAMA AND WATSON M. LAETSCH 605
Glucomannan Biosynthesis Catalyzed by *Pisum sativum* Enzymes. MICHAEL B. HINMAN AND CLARENCE L. VILLEMEZ 608
Effects of Osmotic Gradients on Vacuolar Malic Acid Storage. A Basic Principle in Oscillatory Behavior of Crassulacean Acid Metabolism. ULRICH LÜTTGE, MANFRED KLUGE, AND ERIKA BALL 613
Ribosomal Changes during Induction of Cold Hardiness in Black Locust Seedlings. JAMES A. BIXBY AND GREGORY N. BROWN 617
Effects of Gibberellic Acid, Calcium, Kinetic, and Ethylene on Growth and Cell Wall Composition of Pea Epicotyls. MOHAMMAD H. MONDAL 622
Comparative Study of the Carotenoid Composition of the Seeds of Ripening *Momordica charantia* and Tomatoes. DELIA B. RODRIGUEZ, TUNG-CHING LEE, AND CLINTON O. CHICHESTER 626
pH Dependence of the $Km(CO_2)$ of Ribulose 1,5-Diphosphate Carboxylase. GEORGE BOWES, WILLIAM L. OGREN, AND RICHARD H. HAGEMAN 630
Effect of Glucose on the Induction of Nitrate Reductase in Corn Roots. MUHAMMAD ASLAM AND ANN OAKS 634
Partial Purification and Properties of Ornithine Transcarbamoylase from *Nostoc muscorum* Kützing. SAMUEL F. BOGGESS AND AUBREY W. NAYLOR 640
Auxin Transport Inhibitors. Fluorescein and Related Compounds. GERARD F. KATEKAR AND ART E. GEISSLER 645
Promotion of Softening and Ethylene Synthesis in Bartlett Pears by 3-Methylene Oxindole. CHAIM FRENKEL, VIRGINIA R. HADDON, AND JOANNE M. SMALLHEER 647
Evidence for Covalently Attached *p*-Coumaric Acid and Ferulic Acid in Cutins and Suberins. ROBERT G. RILEY AND P. E. KOLATTUKUDY 650
Endogenous Gibberellins of Pine Pollen. II. Changes during Germination of *Pinus attenuata*, *P. coulteri*, and *P. ponderosa* Pollen. ANIELA KAMIENSKA AND RICHARD P. PHARIS 655
Control by Phytochrome of Cytoplasmic and Plastid rRNA Accumulation in Cotyledons of Mustard Seedlings in the Absence of Photosynthesis. WILFRIED THIEN AND PETER SCHOPFER 660
Studies with Detached Lupin Root Nodules in Culture. I. Maintenance and Induction of Acetylene Reduction Activity. WILLIAM D. SUTTON AND NEIL M. JEPSEN 665
Comparison between Biosynthesis of *ent*-Kaurene in Germinating Tomato Seeds and Cell Suspension Cultures of Tomato and Tobacco YITSHAK YAFIN AND ISHAIAHU SHECHTER 671
Suaeda monoica, a C_4 Plant without Typical Bundle Sheaths. ADIVA SHOMER-ILAN, SVEN BEER, AND YOAV WAISEL 676
A Mathematical Treatment of Rate Data Obtained in Biological Flow Systems under Nonsteady State Conditions. DENNIS S. MARYNICK AND MARILYN C. MARYNICK 680
The Isozymic Similarity of Indoleacetic Acid Oxidase to Peroxidase in Birch and Horseradish. JAMES P. GOVE AND MERRILL C. HOYLE 684

Technique for the Determination of the Rate of Ethylene Production by *Pseudomonas solanacearum*. W. GORDON BONN, LUIS SEQUEIRA, AND CHRISTEN D. UPPER 688
Nitrate Uptake and Induction of Nitrate Reductase in Excised Corn Roots. CARLOS A. NEYRA AND RICHARD H. HAGEMAN 692
Stoichiometric Correlation of Malate Accumulation with Auxin-dependent K^+-H^+ Exchange and Growth in *Avena* Coleoptile Segments. HANS-PETER HASCHKE AND ULRICH LÜTTGE 696
Energy Supply and Light-enhanced Chloride Uptake in Wheat Laminae. IAN R. MACDONALD, ALAN E. S. MACKLON, AND ROLAND W. G. MACLEOD 699
Effect of Temperature on Respiration of Mitochondria and Shoot Segments from Cold-hardened and Nonhardened Wheat and Rye Seedlings. M. KEITH POMEROY AND CHRIS J. ANDREWS 703
Determination of Unfrozen Water in Winter Cereals at Subfreezing Temperatures. LAWRENCE V. GUSTA, MICHAEL J. BURKE, AND AMIN C. KZAPOOR 707
Cytochemical Demonstration of Malate Synthase and Glycolate Oxidase in Microbodies of Cucumber Cotyledons. JOHN J. BURKE AND RICHARD N. TRELEASE 710
Effect of Oxygen on Photosynthesis by Spinach Leaf Protoplasts. MIKIO NISHIMURA, DOUGLAS GRAHAM, AND TAKASHI AKAZAWA 718

Number 6. December

Ozone-induced Loss of Intracellular Potassium Ion from *Chlorella sorokiniana*. PHROSENE E. CHIMIKLIS AND ROBERT L. HEATH 723
Photoactivation of NAD Kinase through Phytochrome. Phosphate Donors and Cofactors. TAKAFUMI TEZUKA AND YUKIO YAMAMOTO 728
Endogenous Abscisic Acid Levels in Germinating and Nongerminating Lettuce Seed. JOSEPH W. BRAUN AND ANWAR A. KHAN 731
Red-Far Red Reversible Effect on Polysome Formation in the Embryos of *Pinus thunbergii* Seeds. NAOKI YAMAMOTO, MASAO HASEGAWA, SATOHIKO SASAKI, AND SUMIHIKO ASAKAWA 734
Association of Phytochrome with Rough-surfaced Endoplasmic Reticulum Fractions from Soybean Hypocotyls. FRANCIS Q. WILLIAMSON, D. JAMES MORRÉ, AND MARK J. JAFFE 738
Auxin: Its Role in Genetic Tumor Induction. IRA H. AMES AND PATRICIA W. MISTRETTA 744
Promotion of Sorghum Callus Growth by the s-Triazine Herbicides. HASSAN M. NADAR, MAX D. CLEGG, AND JERRY W. MARANVILLE 747
Photoautotrophic Growth and Photosynthesis in Tobacco Callus Cells. MARY B. BERLYN AND ISRAEL ZELITCH 752
Effect of Gibberellic Acid on the Plasticity and Elasticity of *Avena* Stem Segments. PAUL A. ADAMS, MICHAEL J. MONTAGUE, MARK TEPFER, DAVID L. RAYLE, HIROSHI IKUMA, AND PETER B. KAUFMAN 757
Effect of Altered pO_2 in the Aerial Part of Soybean on Symbiotic N_2 Fixation. BRUNO QUEBEDEAUX, ULYSSES D. HAVELKA, KENNETH L. LIVAK, AND RALPH W. F. HARDY 761
Cellulase Activity, Endogenous Abscisic Acid, and Ethylene in Four Citrus Cultivars during Maturation. GORDON K. RASMUSSEN 765
Temperature Regulation of Germination in Crimson Clover Seeds. TE MAY CHING 768
Distribution and Nonphotochemical Transformation of Phytochrome in Subcellular Fractions from *Pisum* Epicotyls. KATSUSHI MANABE AND MASAKI FURUYA 772
Heritable Variation in a Polypeptide Subunit of the Major Storage Protein of the Bean, *Phaseolus vulgaris* L. JEANNE ROMERO, SAI-MING M. SUN, ROBERT C. MCLEESTER, FREDERICK A. BLISS, AND TIMOTHY C. HALL 776
Cell-free Synthesis of the Major Storage Protein of the Bean, *Phaseolus vulgaris* L. SAI-MING M. SUN, BARRY U. BUCHBINDER, AND TIMOTHY C. HALL 780
Purification of *myo*-Inositol 1-Phosphate Synthase from Rice Cell Culture by Affinity Chromatography. EDWARD A. FUNKHOUSER AND FRANK A. LOEWUS 786
Temperature Dependence of Chlorophyll *a* Fluorescence in Relation to the Physical Phase of Membrane Lipids Algae and Higher Plants. NORIO MURATA AND DAVID C. FORK 791
Occurrence of Some Enzymes in Starchy Endosperm and Hormonal Regulation of Isoperoxidase in Aleurone of Wheat. KARLING TAO AND ANWAR A. KHAN 797
Inhibitory Action of Five Tannins on Growth Induced by Several Gibberellins. FREDERICK B. GREEN AND MARY RITZEL CORCORAN 801
Asparagine Metabolism—Key to the Nitrogen Nutrition of Developing Legume Seeds. CRAIG A. ATKINS, JOHN S. PATE, AND PATRICK J. SHARKEY 807
Water Permeability during Tomato Fruit Development in Normal and *rin* Nonripening Mutant. B. W. POOVAIAH, YOSEF MIZRAHI, HERBERT C. DOSTAL, JOE H. CHERRY, AND A. CARL LEOPOLD 813
Biochemical Properties of Mitochondrial Membrane from Dry Pea Seeds and Changes in the Properties during Imbibition. SATSUKI SATO AND TADASHI ASAHI 816
A Rapid Technique for the Estimation of Polynucleotide Adenyltransferase and Ribonucleic Acid Polymerase in Plant Tissues. TREVOR J. WALTER AND RUSTY J. MANS 821
Effect of Gibberellic Acid, Kinetin, and Ethylene plus Carbon Dioxide on the Thermodormancy of Lettuce Seed (*Lactuca sativa* L. cv. Mesa 659). ROBERT D. KEYS, ORRIN E. SMITH, JUNJI KUMAMOTO, AND JESSYE L. LYON 826
Restoration of Organic Acid Accumulation in Sectioned Leaves of *Bryophyllum tubiflorum* Harv. THOMAS B. KINRAIDE AND MARK J. BEHAN 830

Development and Intracellular Distribution of Enzymes of the Oxidative Pentose Phosphate Cycle in Radish Cotyledons. CLAUS SCHNARRENBERGER, MARTHA TETOUR, AND MARIA HERBERT 836
Leaf Water Stress in Engelmann Spruce. Influence of the Root and Shoot Environments. MERRILL R. KAUFMANN 841
Mechanical Inhibition of Hypocotyl Elongation Induces Radial Enlargement. Implications for Cytokinin Action. TERRI S. VICTOR AND LARRY N. VANDERHOEF 845
Photocontrol of Fungal Spore Germination. JOHN A. LUCAS, RICHARD E. KENDRICK, AND CURTIS V. GIVAN 847
Isolation of Nucleoli and Localization of Ribonucleic Acid Polymerase I from Soybean Hypocotyl. CHU-YUNG LIN, THOMAS J. GUILFOYLE, MIH-MING CHEN, AND JOE L. KEY 850
Purification of NADH-Nitrate Reductase by Affinity Chromatography. LARRY P. SOLOMONSON 853
Evidence for Ammonium-dependent *de Novo* Synthesis of Glutamate Dehydrogenase in Detached Oat Leaves. ISAAC BARASH, HENIA MOR, AND TOVA SADON 856
Title Page i
Volume Contents iii
Author Index ix
Subject Index xiii

Author Index

A

Adams, Paul A., 757
Abeles, Frederick B., 404
Akazawa, Takashi, 718
Albersheim, Peter, 286
Allen, L. Hartwell, Jr., 245
Ames, Ira H., 744
Anderson-Prouty, Anne J., 286
Andrews, Chris J., 703
Armitage, Terence L., 600
Asahi, Tadashi, 816
Asakawa, Sumihiko, 734
Aslam, Muhammad, 634
Aspinall, Donald, 259
Atkins, Craig A., 807
Avila, Epifanio Jiménez, 460
Ayers, George S., 381
Avron, Mordhay, 481
Aylor, Donald E., 97

B

Baer, Charles H., 434
Bailey, Wilf Mc., 550
Baldwin, Joan K., 216
Ball, Erika, 613
Balmer, Robert T., 464
Bamberger, Elchanan S., 481
Bandurski, Robert S., 143
Barash, Isaac, 856
Bassi, Pawan K., 335
Beardsell, Michael F., 207
Beasley, Charles A., 394
Beer, Sven, 676
Behan, Mark J., 830
Behrend, Josef, 584
Ben-Amotz, Ami, 72
Bennett, Howard W., 474
Berlyn, Mary B., 752
Beyer, Elmo M., Jr., 273
Bhullar, Balwant S., 1
Bingham, Gail E., 245
Bixby, James A., 617
Bliss, Fredrick A., 776
Blyther, Ralph S., 415
Boggess, Samuel F., 259, 640
Bonn, W. Gordon, 688
Bourque, Don P., 160
Boussiba, Samy, 337
Bowes, George, 630
Boyer, John S., 222, 228
Braun, Joseph W., 731
Briggs, Winslow R., 157
Brown, Gregory N., 617
Brown, Kirk W., 595
Buchbinder, Barry U., 780
Burke, John J., 710
Burke, Michael J., 707
Burton, Robert L., 385

C

Carroll, James E., 410
Chang, H., 78
Chen, Yih-Ming, 78
Chen, Mih-Ming, 850
Cherry, Joe H., 544, 813
Chia, Subrina Li-Li, 39
Chichester, Clinton O., 626
Chimiklis, Phrosene E., 723
Ching, Te May, 768
Chlyah, Hassane, 28
Chrispeels, Maarten J., 292
Clay, Willard F., 523
Clegg, Max D., 747
Clingenpeel, Winfred J., 160
Clutter, Mary, 570, 575
Cohen, Daniel, 207
Corcoran, Mary Ritzel, 801
Correll, David L., 340
Cowles, Joe R., 526
Crookston, R. Kent, 194

D

Daly, J. M., 1
Davies, Lindsay J., 60
De LaRosa, Daniel, 442
Demarly, Yves, 28
Dhindsa, Rajinder S., 394
Dickinson, David B., 83
Dickmann, Donald I., 23
Dickson, Richard E., 185
Dollwet, Helmar H. A., 552
Dorsky, David, 318
Doss, Robert P., 360
Dostal, Herbert C., 544, 547, 813
Dwelle, Robert B., 529

E

Edelman, Marvin, 345
Edwards, Gerald E., 324
Edwards, Wayne J., 425
Egan, James M., Jr., 318
Erbes, David L., 72
Erner, Yair, 279
Ezeta, Fernado N., 148

F

Ferrari, Giovanni, 478
Fisher, Donald B., 555
Fletcher, John S., 450
Flint, Dennis, 381
Floyd, Gary L., 399
Fluhr, Robert, 497
Fork, David C., 508 791
Franks, Jeffrey G., 464
Frenkel, Chaim, 647
Funkhouser, Edward A., 786
Furuya, Masaki, 772

G

Gaither, Douglas H., 404
Geissler, Art E., 645
Gholson, Robert K., 385
Gibbs, Martin, 72, 164
Ginzburg, Chen, 51
Givan, Curtis V., 847
Glass, Anthony, 377
Goldschmidt, Eliezer E., 279
Goldstein, Neil H., 313
Gordon, John C., 23
Gove, James P., 684
Graham, Douglas, 718
Green, Frederick B., 801
Guern, Jean, 356
Guilfoyle, Thomas J., 78, 850
Gulati, Dushyant K., 420
Gusta, Lawrence V., 707

H

Haddon, Virginia R., 647
Hageman, Richard H., 630, 692
Hall, Timothy C., 776, 780
Hanson, John B., 13
Hardy, Ralph W. F., 761
Harel, Eitan, 486, 497
Harris, N., 292
Harrison, Michael A., 250
Haschke, Hans-Peter, 696
Hasegawa, Masao, 734
Havelka, Ulysses D., 761
Heath, Robert L., 181, 723
Hensley, Jerry R., 13
Herbert, Maria, 836
Hinman, Michael B., 608
Hirsh, Ann M., 390
Ho, David Tuan-hua, 56
Hopkins, David W., 157
Horton, Peter, 113
Hoyle, Merrill C., 684
Huang, Chi-Ying, 222, 228
Huber, Steven C., 324
Huff, Albert K., 429

I

Ikuma, Hiroshi, 468, 757
Ingle, John, 255
Ingle, Morris, 434
Isenberg, Francis M. R., 410

J

Jackson, William A., 148
Jacobs, Mark, 373
Jaffe, Mark J., 738
Jen, Joseph J., 452
Jepsen, Neil M., 665
Job, Donald D., 130
Johnson, Clarence M., 300
Jones, Russell L., 267, 300, 307
Jordan, Wayne R., 595
Juliano, Bienvenido O., 579
Juneja, Prem S., 385

K

Kamienska, Aniela, 655
Kapoor, Amin C., 707
Katekar, Gerard F., 645
Katterman, Frank R. H., 523
Katz, Esther, 486
Kaufman, Peter B., 757
Kaufmann, Merrill R., 841
Kendrick, Richard E., 332, 847
Key, Joe L., 39, 78, 364, 850
Keys, Robert D., 826
Khan, Anwar A., 263, 731, 797
Kinraide, Thomas B., 830
Klein, Attila O., 88
Klein, Shimon, 486, 497
Kliewer, W. Mark, 370
Kliewer, W. Mark, 67
Kluge, Manfred, 613

Koeppe, David E., 216
Kolattukudy, P. E., 650
Krenzer, Eugene G., Jr., 194
Kumamoto, Junji, 826

L

Laetsch, Watson M., 605
LaMotte, Clifford E., 425
Larson, Philip R., 185
Lakso, Alan N., 370
Lawson, Verna R., 44
Lee, Tung-Ching, 626
Leech, Rachel M., 113
Leguay, Jean-Jacques, 356
Lemon, Edgar R., 245
Leopold, A. Carl, 813
Lepe, Beatriz Gómez, 460
Levi, Carolyn, 164
Lin, Chu-Yung, 39, 78, 850
Lippincott, Barbara B., 213
Lippincott, James A., 213
Livak, Kenneth L., 761
Loewus, Frank A., 283, 786
Lord, J. Michael, 600
Lucas, John A., 847
Lüttge, Ulrich, 613, 696
Lyon, Jessye L., 826

M

MacDonald, Ian R., 105, 109, 699
Machlachlan, Gordon A., 34
Macklon, Alan E. S., 105, 699
MacLeod, Roland W. G., 699
Manabe, Katsushi, 772
Mancinelli, Alberto L., 351
Mans, Rusty J., 821
Maranville, Jerry W., 747
Marbach, Irith, 93
Marcus, Abraham, 502
Marynick, Dennis S., 680
Marynick, Marilyn C., 680
Mateles, Richard I., 584
Mayer, Alfred M., 93
McGlasson, William B., 544, 547
McKersie, Bryan D., 518
McLeester, Robert C., 776
McMillan, Paul N., 160
Meller, Erna, 486, 497
Merrett, Michael J., 600
Meudt, Werner J., 474
Miller, Raymond J., 216
Mistretta, Patricia W., 744
Mizrahi, Yosef, 544, 813
Mondal, Mohammad H., 622
Montague, Michael J., 167, 757
Moore, Thomas S., Jr., 177
Mor, Henia, 856
Morgan, Ella J., 442
Morré, D. James, 738
Moss, Dale N., 194
Murata, Norio, 508, 791
Murray, Allen K., 143

N

Nadar, Hassan M., 747
Naylor, Aubrey W., 160, 640
Negbi, Moshé, 157
Ne'eman, Emma, 486
Neyra, Carlos A., 692
Nishimura, Mikio, 718

O

Oaks, Ann, 634
Obendorf, Ralph L., 502
Ogren, William L., 630
Okubo, Kazuyoshi, 19
Özelkök, Sözer I., 239

P

Paleg, Leslie G., 259
Palmer, J. Elizabeth, 233
Parker, Patrick L., 126
Parlange, Jean-Yves, 97
Pate, John S., 807
Paull, Robert E., 300, 307
Pauu, Alan 526
Pearcy, Susan C., 385
Peavey, Dwight G., 72
Pendergrass, Ann, 410
Perdon, Alicia A., 579
Perez, Consuelo M., 579
Pharis, Richard P., 655
Pomeroy, M. Keith, 703
Poovaiah, B. W., 547, 813
Purohit, Aditya N., 335

Q

Quebedeaux, Bruno, 761

R

Rabino, Isaac, 351
Rabinowitz, Hannah, 345
Rao, V. Sivaji, 263
Rappaport, Lawrence, 60
Rasmussen, Gordon K., 765
Ray, Peter M., 373
Rayle, David L., 757
Raymond, Yves, 34
Rehfeld, Dwayne W., 1
Reisfeld, Avi, 345
Renosto, Franco, 478
Resurreccion, Adoracion P., 579
Reuveni, Oded, 279
Richmond, Amos E., 337
Riederer-Henderson, Mary Ann, 72
Ries, Stanley K., 381
Rikin, Arnon, 337
Riley, Robert G., 650
Robinson, Simon P., 535
Rodriguez, Delia B., 626
Romani, Roger J., 239
Romero, Jeanne, 776
Rosenthal, Gerald A., 420
Ross, Cleon W., 429
Ruffner, H. P., 67
Russell, Jane H., 332

S

Sabharwal, P. S., 420
Sacher, Joseph A., 442
Sadon, Tova, 856
Sagher, Daphna, 345
Salisbury, Jeffrey L., 399
Sankhla, Narendra, 263
Sasaki, Satohiko, 734
Sato, Satsuki, 816
Scandalios, John G., 56
Schiff, Jerome A., 313, 318
Schnarrenberger, Claus, 836
Schopfer, Peter, 660
Schultz, David, 126
Schwartzbach, Steven D., 313
Scott, Kevin J., 550
Seeman, Robert E., 552
Seibert, Michael, 130
Sequeira, Luis, 688
Sharkey, Patrick J., 807
Schechter, Ishaiahu, 671
Shibasaki, Kazuo, 19
Shomer-Ilan, Adiva, 676
Shore, Gordon, 34
Silflow, Carolyn, 364
Silk, Wendy Kuhn, 267
Silvius, John E., 434
Sinclair, Thomas R., 245
Smallheer, Joanne M., 647
Smith, Orrin E., 826
Smith, William O., Jr., 340
Solomonson, Larry P., 853
Southworth, Darlene, 83
Spiegel, Sara, 502
Starks, Kenneth J., 385
Steiner, Gary W., 415
Stevens, Catherine L. R., 126
Sugiyama, Tatsuo, 605
Stoddart, John L., 438
Sun, Sai-ming M., 776, 780
Sussex, Ian, 570, 575
Sutton, William D., 665

T

Tao, Kar-Ling, 797
Tepfer, Mark, 757
Tetley, Richard M., 140
Tetour, Martha, 836
Tezuka, Takafumi, 728
Thanh Van, Marie Tran, 28
Thanh, Vu Huu, 19
Theimer, Eva, 100
Theimer, Roland R., 100
Thien, Wilfried, 660
Thimann, Kenneth V., 140
Thomas, Howard, 438
Thomas, James C., 595
Thomas, Ronnie L., 452
Thomas, Tudor H., 410
Thompson, John E., 518
Timmis, Jeremy, 255
Ting, Irwin P., 394
Tobin, Elaine M., 88
Towill, Leslie R., 468
Travis, Robert L., 39
Tregunna, E. Bruce, 335
Trelease, Richard N., 710
Troughton, John H., 508

U

Upper, Christen D., 688

V

Van Baalen, Chase, 126
Vanderhoef, Larry N., 222, 228, 845
Vasconcelos, Aurea C., 399
Victor, Terri S., 845
Villareal, Ruth M., 579
Villemez, Clarence L., 608

W

Waisel, Yoav, 676
Walbot, Virginia, 570, 575
Walter, Trevor J., 821
Walton, Daniel C., 250

Wardell, William L., 171
Watrud, Lidia S., 216
Webb, Warren L., 455
Weidner, Manfred, 590
Weimberg, Ralph, 8
Weintraub, Robert L., 44
Wetherbee, Phyllis J., 130
Widholm, Jack, 233
Williamson, Francis A., 738
Wills, Ron B. H., 550
Wiskich, Joseph T., 121, 535

Y

Yafin, Yitshak, 671
Yamamoto, Naoki, 734
Yamamoto, Yukio, 728
Yang, Joan C., 283
Yelenosky, George, 540

Z

Zelitch, Israel, 752
Ziemens, Corinna, 590

Plant Physiol. (1975) *56*, xiii–xvi

Subject Index

A

Abscisic acid
  benzyladenine reversal of inhibition, 575
  effects on RNA metabolism, 570
  endogenous
    in citrus fruit, 765
    in lettuce seed, 731
  in tobacco cross-adaptation, 337
  leaf water status, 207
  metabolism in water-stressed leaves, 250
  mutant tomato ripening, 544
Abscission of bean and *Impatiens*, 529
Acer pseudoplatanus, regulation of cell division by 2,4-D, 356
Acetylene reduction at low potentials, 222, 228
Actinomycin D, paradoxical effect, 442
Adenosine triphosphate, protochlorophyllide in corn etioplasts, 113
Alcohol dehydrogenases in germinating corn scutellum, 56
Aleurone, wheat, enzymes, 797
Alfalfa, DNA polymerase of bacteriods, 526
Alga
  hydrogen metabolism, 72
  O_2 isotope effects in photosynthesis, 126
  phase of membrane lipids and fluorescence, 791
Alkylguanides, ion transport, 460
Amino acids
  canaline-urea cycle, 420
  control of synthesis in tissue culture cells, 450
  effect on growth, 584
δ-Aminolevulinic acid, accumulation in greening leaves, 486, 497
Anthocyanin, photocontrol of synthesis, 351
Ascorbic acid, oxalic acid formation from, 283
Asparagine metabolism in legume seeds, 807
Aspartate, regulation of formation in mesophyll protoplast extracts of C_4 plants, 324
Auxin
  genetic tumor induction, 744
  isolation of soybean nuclei, 78
  sites of action, 404
  transport inhibitors, 645
Avocado, ripening and retention of respiratory control by mitochondria 239

B

Bacteroids, alfalfa, DNA polymerase, 526
Banana, farnesene and chilling injury, 550
Barley
  guanidines and ion transport, 460
  neutral metabolite of benzyl alcohol, 385
  Δ^1-pyrroline-5-carboxylic acid dehydrogenase, 259
  red light effects on growth, 44
  regulation of K^+ absorption in roots, 377
Bean
  ABA effects on RNA metabolism, 570, 575
  ABA metabolism in water-stressed leaves, 250
  castor, phosphatidylserine synthesis in endosperm, 177
  catalase and H_2O_2-generating oxidases in endosperm, 100
  cell-free synthesis of storage protein, 780
  heritable variation in seed protein, 776
  jack, water stress and chloroplast development, 160
  mung, protein body autolysis, 292
  red kidney, abscission, 529
Benzyladenine
  mutant tomato ripening, 544
  reversal of ABA inhibition, 575
Benzyl alcohol, neutral metabolite of, in barley, 385
Berry, grape, phosphoenolpyruvate carboxykinase activity, 67
Birch, isozymes of IAA oxidase and peroxidase, 684
Bryophyllum tubiflorum, organic acid accumulation, 830
Bud, distribution of cell division centers during formation of, 28

C

C_4 plants, photosynthesis and acid formation, 324
Calcium
  dark-reversion of phytochrome, 157
  effects on pea epicotyls, 622
Canaline-urea cycle amino acids, growth effects with *Lemna*, 420
Carbohydrate metabolism in rice grain, 579
Carbon, photoassimilated, in Douglas fir seedlings, 455
Carbon dioxide
  compensation points of flowering plants, 194
  inhibitors of assimilation, 481
  lettuce seed thermodormancy, 826
  requirements for phytochrome action in photoperiodism and seed germination, 335
Carbon dioxide fixation
  corn blight toxin, 1
  gladiolus dormancy, 51
  in *Kalanchoë* chloroplasts, 164
Carotenoids
  seed, 626
  tomato, phytochrome, 452
Carrot, analog-resistant cell cultures, 233
Catalase in bean endosperm, 100
Catechol oxidase, seed permeability, 93
Cell division centers, distribution on epidermis, 28
Cellulose activity in citrus fruit, 765
Cellulose, site of synthesis, 34
Cereals, unfrozen water in, 707
Chloride
  light-enhanced uptake by wheat laminae, 105
  uptake in wheat laminae, 699
Chlorophyll, synthesis in greening leaves, 486, 497
Chlorophyll *a*, temperature dependence of fluorescence, 791
Chloroplasts
  Euglena
    action spectra in development, 318
    control of paramylum degradation, 313
    isolation, 399
  jack bean, water stress, 160
  Kalanchoë, CO_2 fixation, 164
  lettuce, inhibitors of CO_2 assimilation, 481
  lettuce and spinach, phase of membrane lipids and photosynthesis, 508
  spinach, SO_2 inhibition of photosynthesis, 434
Chromatography
  affinity, purification of NADH-nitrate reductase from, 853
  high pressure liquid, of cytokinins, 410
Citric acid, growth factor from orange juice, 279
Citrus fruit
  cellulase activity, ABA, and ethylene, 765
  cold hardening, 540
Clover, temperature control of seed germination, 768
Cold hardening in citrus stems, 540
Cold hardiness in locust seedlings, 617
Coleoptile
  oat, auxin-induced growth and malate increase, 696
  wheat and barley, red light effects on growth, 44
Corn
  Action of valinomycin in uncoupling mitochondria, 13
  alcohol dehydrogenases in scutellum, 56
  blight toxin and CO_2 fixation, 1
  d-5 dwarf, gibberellin metabolism, 60
  effect of ATP on protochlorophyllide, 113
  leaf water status, ABA, and stomatal resistance, 207
  nitrate reductase induction by glucose, 634
  nitrate translocation by detopped seedlings, 148
  nitrate uptake, 692
  outer membrane role in toxin response, 216
  root cap slime, 300, 307
  water use efficiency, 245
Cotton
  DNA synthesis in radicles, 523
  osmoregulation in fiber, 394
  stomatal regulation, 595
Cottonwood, incorporation of ^{14}C into leaves, 185
Cotyledons
  cucumber, microbody cytochemistry, 710
  cytoplasmic membrane senescence, 518
  mung bean, protein body autolysis, 292
  radish
    growth promotion by zeatin and red light, 429
    oxidative pentose phosphate cycle, 836
Coumeric acid in cutins and suberins, 650
Crown gall tumor responsiveness to octopine and lysopine, 213

Cucumber, microbody cytochemistry in cotyledons, 710
Cutins, phenolic acids in, 650
Cycloheximide, sulfate transport inhibition, 478
Cytokinins
  chromatographic separation, 410
  in bacterial leaf nodules, 425
Cytoplasmic membrane senescence in cotyledons, 518

D

Deoxyribonucleic acid polymerase of *Rhizobium meliloti* and alfalfa bacteroids, 526
Deoxyribonucleic acid synthesis in cotton radicles, 523
2,4-Dichlorophenoxyacetic acid regulation of cell division, 356
Digitonin, subchloroplast particles, 535
Dormancy, gladiolus, CO_2 fixation, 51

E

Electrodes, conversion of signals from ion-specific, to linear concentrations, 181
Embryo, wheat, RNA transcription, 502
Endoplasmic reticulum, phytochrome, 738
Endosperm
  bean, catalase and H_2O_2-generating oxidases, 100
  castor bean, phosphatidylserine synthesis, 177
  protein synthesis in maturing wheat seed, 381
Enzymes
  cell wall, growth, 143
  photosynthetic, control of, in pea, 8
Epicotyl, pea, GA, Ca, kinetin, and ethylene effects, 622
Epidermis, distribution of cell division centers, 28
Ethrel, synergistic effects of kinetin and, 263
Ethylene
  effects on pea epicotyls, 622
  in citrus fruit, 765
  in leaf and fruit of mutant tomatoes, 547
  lettuce seed thermodormancy, 826
  measurement, 688
  propylene as competitor of action of, 552
  regulation of production of, by inhibitors of auxin transport, 404
  synthesis in pear, 647
Etioplast, corn, effect of ATP on protochlorophyllide, 113
Euglena
  action spectra in chloroplast development, 318
  control of paramylum degradation, 313
  isolation of chloroplasts, 399
  RUDPcase from, 345, 600

F

α-Farnesene, chilling injury of bananas, 550
Fern
  effect of sucrose on differentiation of tissue, 390
  photocontrol of spore germination, 468
Ferulic acid in cutins and suberins, 650
Fescue, meadow, leaf senescence, 438
Fir, Douglas, photoassimilated carbon, 455
Flowering, *Lemna*, inhibitor treatment, 360
Fluorescein, auxin transport inhibition, 645
Fluorescence, chlorophyll *a*, temperature dependence, 791
p-Fluorophenylalanine, carrot and tobacco cell cultures resistant to, 233
Fungus, photocontrol of spore germination, 847

G

Gene activity, quantitative regulation, 255
Geotropism, regulation by inhibitors of auxin transport, 404
Germination
  alcohol dehydrogenases in corn scutellum, 56
  fungal spore, photocontrol, 847
  of fern spores, photocontrol, 468
  temperature regulation in clover, 768
Gibberellin
  effects on pea epicotyls, 622
  inhibition of elongation induced by, 167
  lettuce seed thermodormancy, 826
  metabolism in *d-5* maize, 60
  oat stem plasticity and elasticity, 757
  of pine pollen, 655
  response in lettuce hypocotyl, 267
  tannins and growth induced by, 801
Gladiolus, CO_2 fixation and dormancy, 51
Globulins, multiple 7S, of soybean proteins, 19
β-1,3-Glucan synthase from lily pollen, 83
Glucomannan biosynthesis catalyzed by pea enzymes, 608
Glucose, nitrate reductase induction, 634
Glutamate dehydrogenase in oat leaves, 856
Glycolate oxidase in cucumber cotyledon microbodies, 710
Grape
  phosphoenolpyruvate carboxykinase activity, 67
  temperature and malic acid metabolism, 370
Greenbug resistance in small grains, 385
Growth
  ABA effects, 570, 575
  auxin-induced, malate increase, 696
  cell wall enzymes, 143
  of wheat and barley coleoptiles, red light effects, 44
  regulation by inhibitors of auxin transport, 404

H

Heat, disease resistance in sugarcane, 415
Helminthosporium
  heat-induced resistance to in sugarcane, 415
  outer memberane role in toxin response, 216
  toxin and CO_2 fixation, 1
Herbicides, promotion of sorghum callus growth, 747
Horseradish, isozymes of IAA oxidase and peroxidase, 684
Host-pathogen interactions, 286
Hydrogen metabolism in photosynthetic organisms, 72
Hypocotyl
  lettuce, GA response, 267
  soybean
    elongation, 845
    isolation of nuclei, 78
    RNA polymerase I, 850

I

Imbibition, mitochondrial membrane in pea seeds, 816
Impatiens, abscission, 529
Indoleacetic acid, thymidine incorporation into stem tissue treated with, 171
Indoleacetic acid oxidase, isozymes of, 684
Isoperoxidase, hormonal regulation in wheat aleurone, 797

K

Kalanchoë
  CO_2 fixation in chloroplasts, 164
  pyruvate orthophosphate dikinase, 605
  vacuolar malic acid storage, 613
Kaurene biosynthesis, 671
Kinetin
  effects on pea epicotyls, 622
  lettuce seed thermodormancy, 826
  synergistic effects of ethrel and, 263

L

Laminae, wheat, light-enhanced chloride uptake, 105
Leaf
  bean, ABA metabolism in water stress, 250
  Bryophyllum, organic acid accumulation, 830
  corn, blight toxin and CO_2 fixation, 1
  cotton, stomatal regulation, 595
  cottonwood, incorporation of ^{14}C into, 185
  greening, ALA accumulation, 486, 497
  meadow fescue, senescence, 438
  oat
    glutamate dehydrogenase, 856
    senescence, 140
  poplar, protein synthesis, 23
  spinach, oxygen effect on photosynthesis, 718
  spruce, water stress, 841
  tomato, ethylene in, 547
  vacuum infiltration and photosynthesis, 109
  ventilation to entrain small particles, 97
  water stress and ABA, 207
  wheat
    Cl uptake, 699
    light-enhanced chloride uptake, 105
Legume, asparagine and seed nutrition, 807
Lemma
  growth effects of canaline-urea cycle amino acids, 420
  inhibitor treatment and flowering, 360
Lettuce
  endogenous ABA levels in seed, 731
  gibberellin response in hypocotyl, 267
  inhibitors of CO_2 assimilation, 481
  phase of membrane lipids and photosynthesis, 508
  phytochrome in seeds, 332
  synergistic effects of kinetin and ethrel, 263
  thermodormancy of seed, 826
Light
  effects on tissue development, 130
  red
    radish cotyledon growth and reducing sugar content, 429
    wheat and barley growth, 44
Lily, β-1,3-glucan synthase from pollen, 83

Lipids, membrane
phase of, and fluorescence, 791
photosynthesis, 508
Locust, cold hardiness in seedlings, 617
Lupin, culturing detached nodules, 665
Lysopine, crown gall tumor growth, 213

M

Magnesium, dark reversion of phytochrome, 157
Maize. *See* Corn
Malate
accumulation in cotton, 394
regulation of formation in mesophyll protoplast extracts of C_4 plants, 324
Malate synthase in cucumber cotyledon microbodies, 710
Malic acid
accumulation in oat coleoptiles, 696
temperature influence on metabolism in grape berries, 370
vacuolar storage, 613
3-Methylene oxindole, pear ripening, 647
Mimosa, contractile behavior, 464
Mitochondria
avocado and pear, ripening and retention of respiratory control, 239
corn
action of valinomycin in uncoupling, 13
outer membrane role in toxin response, 216
phosphate-dependent substrate transport, 121
Momordica, seed carotenoids, 626
Moss, hydrogen metabolism, 72
Mustard, phytochrome-mediated rRNA accumulation, 660
Myoinositol 1-phosphate synthase from rice, 786

N

Nicotinamide adenine dinucleotide kinase, photoactivation through phytochrome, 728
Nitrate
translocation by detopped corn seedlings, 148
uptake by corn roots, 692
Nitrate reductase, effect of glucose on induction of, 634
Nitrogen, metabolism in plant cell suspension cultures, 584
Nitrogen fixation
at low potentials, 222, 228
oxygen effects, 761
Nonsteady state flow systems, 680
Nostoc, ornithine transcarbamoylase from, 640

O

Oat
auxin-induced growth and malate increase, 696
GA effects on wall plasticity and elasticity 757
glutamate dehydrogenase in leaves, 856
inhibition of GA-induced elongation, 167
leaf senescence, 140
Octopine, crown gall tumor growth, 213
Orange juice, growth factor, 279
Organic acid, restoration of accumulation, 830
Ornithine transcarbamoylase from *Nostoc*, 640
Osmoregulation of cotton fiber, 394
Osmotic gradients, effects on vacuolar malic acid storage, 613
Oxalic acid formation from ascorbic acid, 283
Oxaloacetate, regulation of formation in mesophyll protoplast extracts of C_4 plants, 324
Oxidase, H_2O_2-generating, in bean endosperm, 100
Oxygen
nitrogen fixation, 761
photosynthesis by protoplasts, 718
Oxygen isotope, effects in photosynthesis, 126
Ozone, K^+ efflux induced by, 723

P

Paramylum degradation, control in *Euglena*, 313
Pea
$^{14}C_2H_4$ incorporation and metabolism by seedlings, 273
control of enzyme synthesis, 8
GA, calcium, kinetin, and ethylene effects, 622
glucomannan biosynthesis catalyzed by enzymes, 608
mitochondrial membrane, 816
phytochrome in subcellular fractions, 772
ribosomal proteins, 39
seed permeability and catechol oxidase, 93
Pear
ripening and retention of respiratory control by mitochondria, 239
ripening by 3-methylene oxindole, 647
Pentose phosphate cycle, oxidative, 836
Peroxidase, isozymes of, 684
pH, xyloglucan metabolism, 373
Phosphate, substrate transport into mitochondria dependent on, 121
Phosphatidylserine synthesis in bean endosperm, 177
Phosphoenolpyruvate carboxykinase activity in grape berries, 67
Photoperiodism, CO_2 requirements for phytochrome action, 335
Photosynthesis
acetylene reduction, 228
control of in pea, 8
corn blight toxin, 1
in tobacco callus cells, 752
O_2 isotope effects in photosynthesis, 126
oxygen effect, 718
phase of membrane lipids, 508
SO_2 inhibition, 434
vacuum infiltration, 109
Phytochrome
dark reversion of, and Ca and Mg, 157
endoplasmic reticulum, 738
in pea subcellular fractions, 772
photoactivation of NAD kinase, 728
photomanipulation in lettuce seeds, 332
quaternary structure, 340
rRNA accumulation, 660
tomato carotenoids, 452
gibberellins in pollen, 655
Pine
polysome formation in seed, 734
Plastid, structure in greening leaves, 486
Pollen
lily, β-1,3-glucan synthase, 83
pine, GA, 655
Polynucleotide adenylyltransferase in plant tissue, 821
Polysome levels in pine seeds, 734
Poplar, protein synthesis in leaves, 23
Potassium
accumulation in cotton, 394
regulation of absorption in barley roots, 377
Potassium ion, ozone-induced efflux, 723
Potassium ion transport, alkylguanidines, 460
Propylene, a competitor of ethylene action, 552
Protein
bean seed, heritable variation, 776
body autolysis in bean cotyledons, 292
endosperm, synthesis in maturing wheat seed, 381
pea ribosomal, 39
soybean, multiple 7S globulins, 19
storage, of bean, cell-free synthesis, 780
synthesis in poplar leaves, 23
synthesis in wheat seedlings and temperature, 590
Protochlorophyllide in corn etioplasts, effects of ATP, 113
Pseudomonas solanacearum, measurement of ethylene, 688
Psychotria punctata, cytokinin in bacterial leaf nodules of, 425
Pyrimidine inhibition of GA-induced elongation, 167
Δ^1-Pyrroline-5-carboxylic acid dehydrogenase in barley, 259
Pyrruvate orthophosphate dikinase in *Kalanchoë*, 605

R

Radish
cotyledon growth and reducing sugars, 429
oxidative pentose phosphate cycle, 836
Respiratory control, retention of, and ripening, 239
Rhizobium meliloti, DNA polymerase, 526
Ribonuclease, wound, control of in turnip, 442
Ribonucleic acid
ABA effects on metabolism, 570, 575
plant messenger, isolation and translation, 88
poly(A), in soybean, 364
ribosomal, phytochrome, 660
transcription in wheat embryo, 502
Ribonucleic acid polymerase in plant tissues, 821
Ribonucleic acid polymerase I from soybean hypocotyl, 850
Ribulose diphosphate carboxylase
from autotrophic *Euglena gracilis*, 345
$Km(CO_2)$ of, 630
synthesis *in Euglena*, 600
Rice
carbohydrate metabolism, 579
myoinositol 1-phosphate synthase, 786
Ripening, retention of respiratory control by mitochondria, 239
Root
barley
guanidines and ion transport, 460

Root—*continued*
barley—*continued*
regulation of K^+ absorption, 377
corn
cap slime, 300, 307
nitrate reductase induction by glucose, 634
nitrate uptake, 692
lupin, culturing nodules, 665
Rye, temperature and respiration, 703

S

Scutellum, corn, alcohol dehydrogenases, 56
Seed
bean, heritable variation in protein, 776
clover, temperature control of germination, 768
legume, asparagine and nutrition of, 807
lettuce
endogenous ABA levels, 731
phytochrome, 332
synergistic effects of kinetin and ethrel, 263
thermodormancy, 826
Momordica and tomato, carotenoids, 626
pea
catechol oxidase and permeability, 93
mitochondrial membrane, 816
pine, polysome formation, 734
tomato, kaurene biosynthesis, 671
wheat, synthesis of endosperm proteins, 381
Seedling
corn, nitrate translocation, 148
Douglas fir, photoassimilated carbon in, 455
locust, cold hardiness, 617
mustard, RNA accumulation, 660
pea
$^{14}C_2H_4$ incorporation and metabolism, 273
control of enzyme synthesis, 8
wheat, protein synthesis and temperature, 590
wheat and rye, temperature and respiration, 703
Senescence
cytoplasmic membrane, 518
leaf, in meadow fescue, 438
oat leaf, 140
Silica, isolation of *Euglena* chlorophasts, 399
Sorghum
leaf water status, ABA, and stomatal resistance, 207
promotion of callus growth by herbicides, 747
Soybean
acetylene reduction at low potentials, 222, 228
endoplasmic reticulum and phytochrome, 738
hypocotyl elongation, 845
isolation of nuclei, 78
multiple 7S globulins, 19
oxygen effects on nitrogen fixation, 761
poly(A) RNA, 364
RNA polymerase I, 850
structure of functional sieve elements, 555
Spinach
oxygen effect on photosynthesis, 718
phase of membrane lipids and photosynthesis, 508
SO_2 inhibition of photosynthesis, 434
Spruce, Engelmann, leaf water stress, 841
Stem
citrus, cold hardening, 540
oat
GA effects on plasticity and elasticity, 757
inhibition of GA-induced elongation, 167
tobacco, thymidine incorporation, 171
Forenia fournieri, distribution of cell division centers, 28
Stomatal regulation in cotton, 595
Stomatal resistance, water status and ABA, 207
Stress, water, chloroplast development in bean, 160
Suaeda monoica, 676
Subchloroplast particles, digitonin, 535
Suberins, phenobolic acids in, 650
Sucrose differentiation of fern tissue, 390
Sugarcane, heat-induced, resistance to disease, 415
Sulfate transport inhibition by cycloheximide, 478
Sulfur dioxide inhibition of photosynthesis, 434

T

Tannins, GA-induced growth, 801
Temperature
effect on respiration, 703
malic acid metabolism in grape berries, 370
protein synthesis in wheat seedlings, 590
Thermodormancy of lettuce seed, 826
Thymidine incorporation into stem tissue, 171
Tobacco
ABA in cross-adaptation, 337
analog-resistant cell cultures, 233
kaurene biosynthesis, 671
light effects on tissue development, 130
organogenesis, 474
photoautotrophic growth of callus cells, 752
thymidine incorporation into stem tissue, 171
Tomato
ABA and benzyladenine, 544
ethylene in leaf and fruit, 547
kaurene biosynthesis, 671
phytochrome-mediated carotenoids, 452
seed carotenoids, 626
water permeability, 813
Torenia fournieri distribution of cell division centers, 28
Tumor, genetic, role of auxin in induction of, 744
Turnip, control of wound RNase, 442

V

Vacuum infiltration, photosynthesis, 109
Valinomycin action in uncoupling corn mitochondria, 13

W

Water permeability
in tomato, 813
seed, 93
Water status, leaf, ABA, 207
Water stress
ABA metabolism in bean leaves, 250
corn water use efficiency, 245
spruce leaf, 841
stomatal regulation in cotton, 595
Wheat
Cl uptake, 699
enzymes, 797
light-enhanced uptake by laminae, 105
protein synthesis in seedlings and temperature, 590
red light effects on growth, 44
RNA transcription in embryo, 502
synthesis of endosperm proteins, 381
temperature and respiration, 703

X

Xyloglucan, promotion of metabolism by acid pH, 373

Z

Zeatin, radish cotyledon growth and reducing sugar content, 429